THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCIII. No. 2231.] LONDON, FEBRUARY 13, 1906. [58TH YEAR. PRICE 6d.

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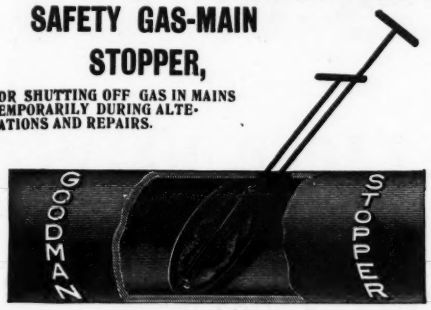

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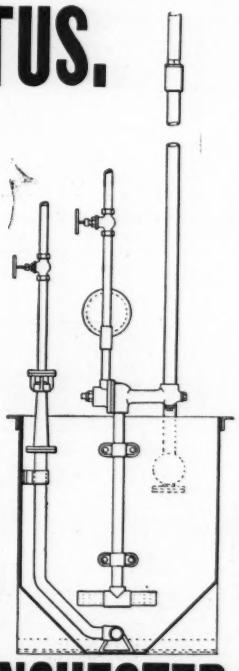

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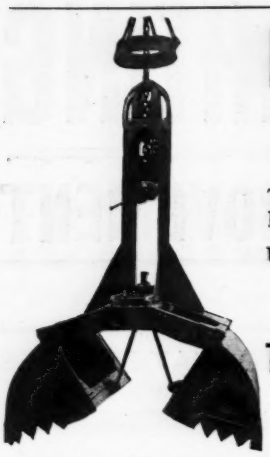

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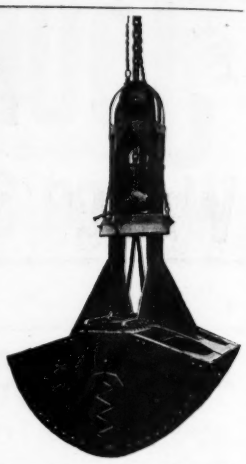

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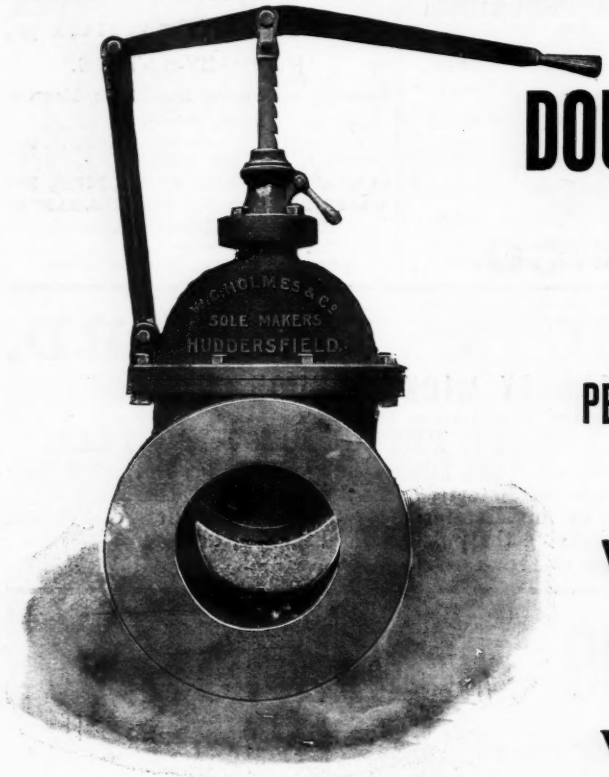

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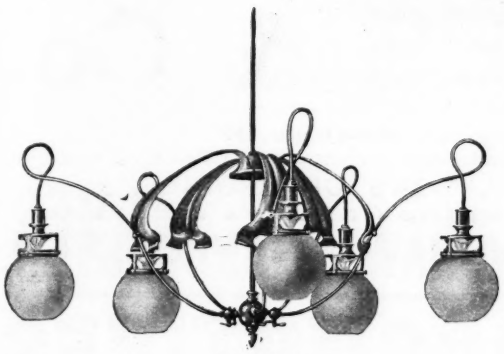

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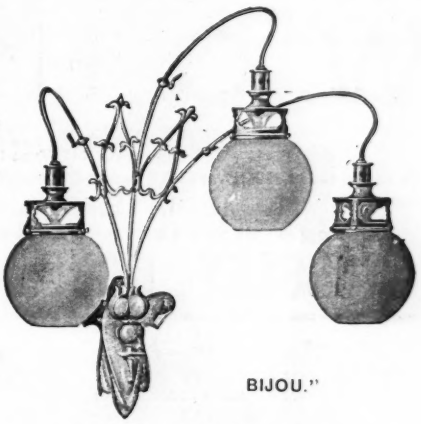

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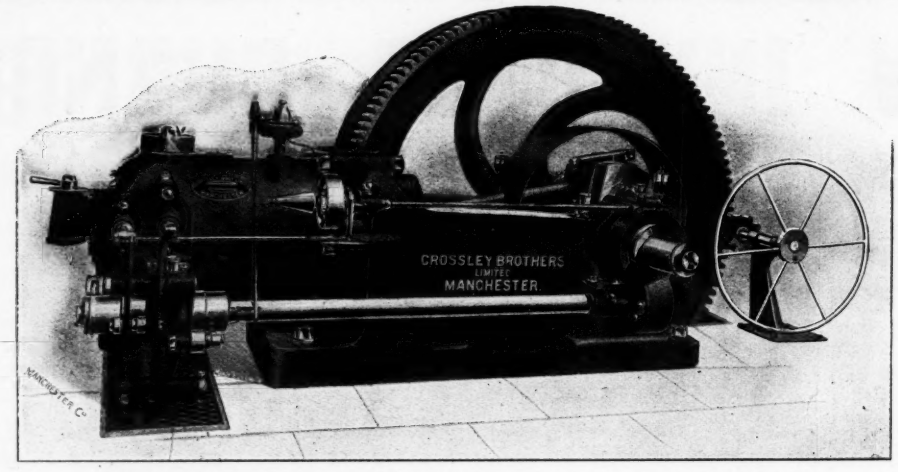

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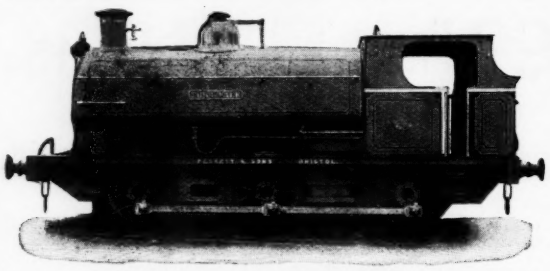

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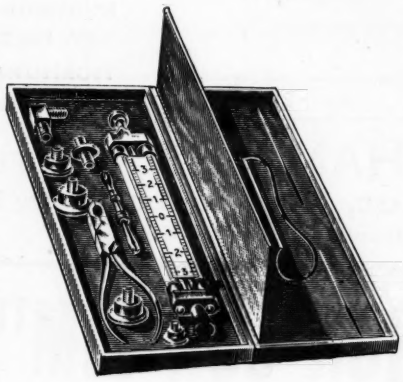

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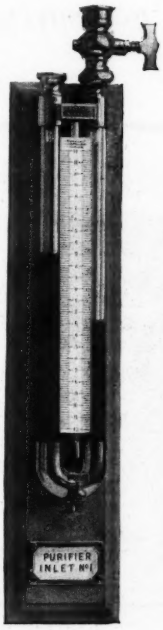

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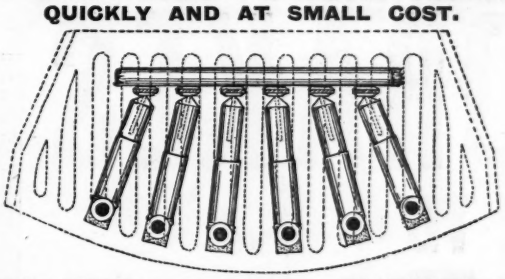

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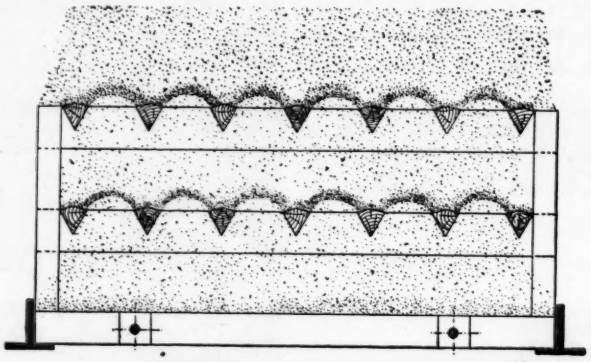

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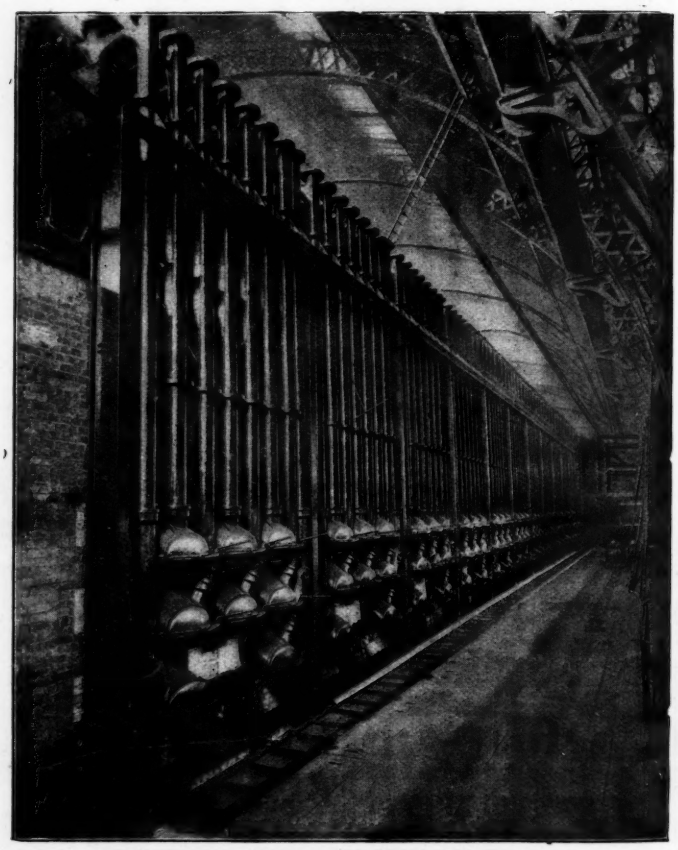

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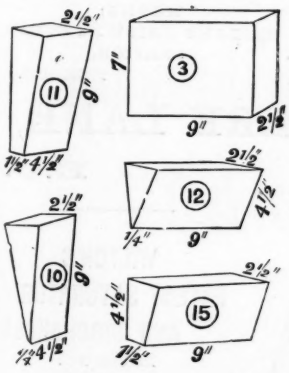

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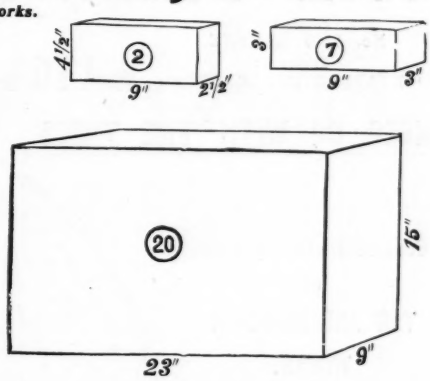

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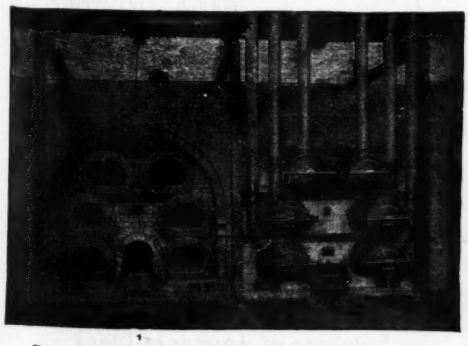

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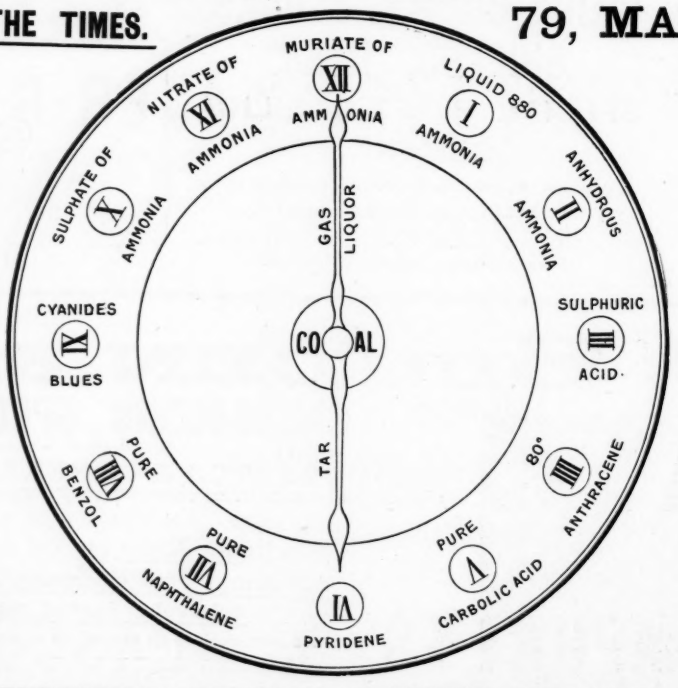

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EDITORIAL NOTES—GAS, &c.

Local Authorities and Sulphur Restrictions.

THE past week has witnessed a great loosening of tongues in certain municipal chambers, on the subject of opposition to the mitigation that is being sought by gas companies of restriction in respect of the sulphur compounds in gas other than sulphuretted hydrogen. There has been a considerable amount of empty talk, and an absence of cogent argument by the opponents, relieved by a display of good sense on the part of men who take the reasonable course of accepting the judgment that has been given by Lord Rayleigh and his colleagues of the Departmental Committee of the Board of Trade, after the penetrating inquiry made into the whole subject, in which inquiry the *pros* and *cons* were advanced by the parties directly interested, with all the force they could command. We report a sample of these municipal discussions; and, in perusing it, it will be remarked that even the medical gentlemen of Reading are at variance on the point as to the ill-effects or otherwise that will follow the release of the Gas Company from the absurd obligation to eliminate a number of grains of sulphur compounds about equal to the amount they are not required to remove. One worthy Alderman, whose contribution to the discussion did not reveal any very special knowledge of this technical question that enables us to say he was a competent critic, asserted that printed matter which had been forwarded to him for his information did not contain any argument; but his opinion was negatived by other members who were impressed by facts that are beyond dispute. It is not a criminal thing that the few companies who are now burdened in this worthless manner should desire to be placed on an equality in this matter with the remaining 440 or so statutory gas companies and the 230 or so local authorities who are not hampered by the sulphur compounds clauses, though, in the narrowness of their view, some few town councillors almost appear to think that it is. The vacuous state of their minds on the subject of the ill-effects that it is fancied will follow the proposed relaxation, is represented by the commonplaces to which they have given utterance. If there is any real suspicion upon the question of ill-effect after the evidence that has been given to the contrary (by the way, a great deal more impurity is thrown off by the combustion of coal than of gas), why do not these councillors take steps to inquire of the 230 local authorities owning gas undertakings who are not under the restrictions, whether the suspicions or imaginations are confirmed by their experiences? If there is any confirmation, then another suggestion may be adopted.

It has transpired that the conference of representatives of local authorities interested in the relieving Bills promoted for the present session of Parliament—or rather a conference attended by the representatives of only ten of the authorities—has been held; and of that conference Mr. H. G. Pritchard was the Secretary. Among the recommendations was one that, in the event of a petition or petitions being presented against the Bill, the Parliamentary Agents Messrs. Sharpe, Parker, Pritchards, and Barham should be recommended to take charge. Mr. A. G. Pritchard, one of the members of the firm, is Secretary to the Association of Municipal Corporations. This is really interesting, because at most there can only be two of the authorities among the members of the Association possessing gas undertakings who are restricted in the amount of sulphur compounds in their gas by Act of Parliament, and are under no obligation to test. Our second suggestion, therefore, is that, if the unrestricted local authorities admit public harm through the want of the restriction, the Association as such should recommend to the members controlling their several gas undertakings that they should, with all possible speed, ask Parliament to impose the restriction upon them, and prescribe an examination that shall enforce obedience to the restriction. In view of what is here stated, could anything be more droll than this agitation against the relief of a few provincial gas companies?

On a previous occasion, it was said in these columns that there was evidence that the hostility that is being displayed to this application for relief by various companies has been officially inspired. We do not retract the statement; but to it may be added the opinion that several of the authorities owning electricity undertakings are unwilling to let go a single string of the control that Parliament gave them before trading in electricity put them in the position of business competitors with company, owned gas undertakings. It is, to say the least, an unrighteous thing that one competitor should have any power of control over another. There is more in this than in the phantom of evil to the public health which is put forward so prominently to screen the true instigations to antagonism. The discussion in the Cheltenham Town Council was illuminating in this regard, and it would seem that envy there is giving birth to a policy of harassment. That is the only construction that can be put upon remarks in the Council, taken in conjunction with the knowledge that, though the Cheltenham Corporation have been in the electricity business for something like ten years, and notwithstanding that they take out of the rates, we believe, about £11,000 a year for the lighting by electricity of approximately one-fourth of the streets, and do not pay more than (say) one-third the amount for the gas lighting of the remaining three-fourths, they have not been so successful that they can claim that their undertaking is a model of prosperity. The discussion of the matter in the Newcastle Corporation furnished another strange argument. It was solemnly declared that it was believed the abrogation of the sulphur clauses would—"enable" was the word used, "result" was the one intended—enable the Companies to use cheap sulphurous coals. Those with technical knowledge of gas manufacture and supply will be amused over this little piece of innocence. There need be no fear that gas companies, with electrical competition at their sides, will do anything to sacrifice their business by delivering a noxious commodity to their customers. Local authorities alert for private electrical business, if they sincerely believe what they profess, should see that an unacceptable supply to the gas consumers would recoil on the companies by consequent loss of business to the municipal electricity undertakings. That is a risk the companies are quite prepared to take; and their willingness, despite the opposition of their local authorities, shows the degree of their fear as to the consequences.

During the past week the Councils of Newcastle, Gateshead, and Cheltenham have resolved to take the initial steps in opposing the two Companies supplying in their areas. In the case of Reading, the necessary majority vote was not obtained at the special meeting of the Town Council held to consider the question. We also learn that the Tottenham District Council are giving further consideration to instituting another prosecution for trivial excesses of sulphur in the gas distributed by the Company. It is a pity that their time is of such little value that they can devote it to a petty affair of this kind.

The Commercial Gas Company's Report.

THE first comment that suggests itself on a perusal of the above report is that it is the briefest of the brief. It almost gives one the impression that, in the opinion of the Directors, all that the shareholders are concerned about is the dividend, and their own re-election and that of the Auditor. Highly important as these matters are, we think they do both themselves and their shareholders an injustice in the limitation thus put upon the report. This is not a trading undertaking as to the affairs of which a bald statement

must suffice since it would be imprudent to divulge details. On the contrary, the Legislature has provided very fully in the prescribed form of accounts for a complete exposition of the financial transactions and position of a gas undertaking. This, however, it is not always easy for the usual run of shareholders to follow; and, although it is almost certain to be completely referred to in the Chairman's speech, some reference in the report to a few, at any rate, of its most salient features would enable those interested—whether experts or not—to realize at a glance, so to speak, the measure of success which has attended the efforts of the Directors. Were it sufficient to rely solely upon the statement of accounts, why not omit altogether the second paragraph from the report, since the balance available for dividend is apparent from the net revenue account? There must of necessity be other matters interesting to the shareholders—such as, for instance, those relating to the policy of the Company in regard to consumers—which might very suitably find a place in the report.

Turning to the statement of accounts for the half year, we have nothing but congratulation to offer the Company and its officials for the excellent results which it exhibits. For the same period, the two other Metropolitan Companies have found it necessary to draw more or less largely from their undivided balances for the payment of the usual dividends; whereas the profit made by this Company is slightly in excess of the amount required for the purpose. How has this very satisfactory comparative result been achieved? There is, first and foremost, the substantial increase of nearly 5½ per cent. in the gas consumption, which, contrasted with the much smaller increases prevailing elsewhere, and also with the increase of only ½ per cent. obtained by the Company for the previous half year, is a matter of surprise as well as of gratification. How this has resulted is to some extent explained by the large increase in the number of prepayment meters in use; the number of these having risen during the past year from 36,000 to 45,224, whereas the ordinary meters increased by only 365. It is quite apparent from these figures that in the Company's district there is fine scope for the employment of prepayment meters; and, with anything like good trade, further expansion of its business in this direction may be looked for. The increase in the number of stoves in use is less by over 800 than that in the number of prepayment meters, which is a little remarkable, seeing that with every such meter a stove is usually supplied. Coal and oil, notwithstanding a large increase in the quantity of gas manufactured, cost less than for the corresponding half year by £2757; purification, over £1000; and repairs and maintenance, a similar amount. Wages, however, have increased by about £500; and distribution figures for the somewhat large increase of nearly £4500, which is attributable probably to depreciation of prepayment meters and fittings. The Chairman may perhaps have something to say about the further increase in rates and taxes; and whether any relief is to be expected from the quinquennial reassessment of the rateable value of the Company's property, or if any such relief may be reasonably anticipated from the controlling influence of the new Government and Parliament. On the other side of the account, there is, as resulting from the large additional consumption, a substantial increase in the receipts for gas and meter and stove rental; tar and liquor having also yielded a small increase, while coke and breeze show a falling off of only £2636. The net result is a credit balance of £61,030, as against one of £53,512 for the corresponding half year; and this, carried to the net revenue account, leaves, after deducting interest, a little more than enough, as already stated, for the payment of dividends at the usual rates. It is evident the Directors can afford to regard with comparative equanimity the rise of the price of coal which almost every week becomes a greater certainty.

With respect to capital expenditure, the Company are not exempted from the prevailing conditions; the total of £23,599 for the half year being wholly on account of distribution. It affords another example, too, of a great preponderance of prepayment meters, the number of which in use by the Company compares with 24,426, which is that of the ordinary meters in present use. It is increasingly evident that the use of this class of meter is capable of influencing materially the prosperity of a gas undertaking, especially where the district supplied is an industrial one; and it therefore behoves all gas suppliers to employ it to the utmost.

Concerning Municipal Account Auditing.

In another part of this issue is published a thoughtful article on the pressing subject of municipal trading by Mr. V. R. Balfour-Browne, whose patronymic is one that is held in the highest esteem in the gas industry. For this reason alone, we should give a most cordial welcome to any contribution from his pen, and more especially when his views, as in this case, so largely coincide with our own. There being this agreement in opinion, there is no intention of commenting upon the subject-matter of the article; but there is one sentence in it which gives an opening for remark on the question of the necessity for the rational auditing of municipal accounts. Mr. Balfour-Browne says: "Up "to the present time, the municipalities have only desired "to lay their hands on enterprises that pay." This may be a fair statement as to the desire; but in attempting to indulge that desire, municipalities have lamentably failed in some of their enterprises, and notably in that of electricity, with the result that there have been many financial enormities, and infidelities to trust, with the sole object of presenting a fictitious profit to the ratepayers. These are things that cannot be hidden for ever; and their exposure, amalgamated with, in the majority of cases, a turgid debt and heavy rates, is expanding the revolt against municipalization and contemporary civic administration generally. The defenders of the municipal faith and practices protest, in the manner in which they are so adept, with platitude and sophism; but underlying it can be traced the fear of further exposure. If all was above-board, what would they have to fear? Even the inquiry by the Departmental Committee appointed by the Right Hon. John Burns—a Committee composed of municipal and Local Government Board officials—obviously holds terror for some of them; and the revival of the request for the examination of the accounts by an independent auditor, as was proposed by the Select Committee on Municipal Trading, is looked at askance, though the time that has lapsed since the Committee sat in 1903 has wonderfully strengthened the reasons for, and added weight to, the request that the proposal should be put into execution, and that with as little delay as possible.

The fear is entertained that searching audit and compulsory financial method—including full and proper charges against each department, with forms of accounts that can be understood by the people—will put municipal trading undertakings in unfair comparison with company enterprise. This argument is eloquent of the confusion of the advocacy of municipalization. The essential principle of municipal trading should be better service, and not the making of profits; and unless better service can be rendered without the financial hocus-pocus that now abounds, then municipal trading cannot be justified. The better service must also embrace precautionary administration, if the ratepayers are to be protected; and at the present time there is no efficient protection accorded to them, or there would not be the infinity of muddle and degrading finance that have time and again provoked the public wrath. It is being pitifully urged that the precautionary measures that it is sought to apply to municipal traders are not attached to companies. The proper comparison in this regard is with statutory companies, most of whom are strictly regulated. If we take gas companies, their precautionary financial methods, as now usually provided for in their Acts of Parliament, consist of the formation of reserve, insurance, and renewal funds, or the payment for renewals out of revenue before arriving at the balance available for dividend, with only new additions carried to capital. But there can be no real comparison between a company and a municipality. The shareholders of the former are so by their own act and will; and it is their own money only that is at stake. On the other hand, the ratepayers are, so to speak, compulsory shareholders in the speculations of the municipalities, whose expenditure there are no existing adequate means of regulating. Shareholders, too, have an immediate hold upon the directors. In the case of the ratepayers, there is not that effective hold; but poor and rich alike are involved in trading failure and blunder, which, where there are also possessed those undertakings which Mr. Balfour-Browne so aptly describes as "gilt-edged," largely or entirely annul any surplus that may be obtained from them. The directors of a company are financially, and in a statutory company to a defined minimum sum, implicated in the business they manage, and are answerable to the shareholders for their actions at frequent intervals.

Town councillors are not personally involved in the rash trading concerns undertaken in the name of the ratepayers; and it is only at distant periods, and then in an indefinite and inane manner, that they have to render an account of their stewardship. On such occasions much that is said has to be taken for granted; for while municipal accounts are involved and incomprehensible, and there is no effective audit as between the ratepayers and the council, there can be no security. Considering these things (and much else might be advanced), the case for compulsory precautionary administration of civic affairs, particularly where municipal trading is concerned, is a strong one.

To a thorough system of audit and methodical accounts we must look for the beginning of reformation in the conduct of our public affairs; and they sadly want reforming. The question of the accounts can now be left until there is information as to what the Departmental Committee will recommend. The subject of auditing, however, has no part in the reference; but it must surely follow as a consequence. There will be very little use in having fixed methods without ensuring proper compliance. Many municipal authorities have by their acts—by their extravagance, by concealment of facts, by their want of prevision and neglect of provision—forfeited the confidence of the ratepayers. Therefore there must be an audit; and the present system of audit (if so it can be described) has failed in its purpose. But it has been useful. It has shown clearly that auditors appointed, controlled, and influenced by the local rulers or by the central authority at Whitehall are not a success. Their directions must rule their actions, if they wish security in their tenure of office. The Committee on Municipal Trading in 1903 proposed that auditors of municipal accounts should be appointed from a distance, should be members of the recognized professional organizations, should hold office for a term of years, and should not then be removed save with the consent of the Local Government Board. All that is good; but as the auditor should be the ratepayers' guardian of faithfulness in the town's financial affairs and of perfection in the disclosure of the finances of every department, there should be some course devised whereby the appointment should be a matter for the ratepayers. The relations between ratepayers and their local governing body have been vastly altered by municipal trading involving profit and loss and bargaining for purchase and sale; and therefore just as in a company an auditor is elected by the shareholders and not by the administration, so it should be the ratepayers and not the municipal administrators who should appoint the professional man whose duty it is to investigate the integrity of the urban accounts. The report of such an auditor should be presented not only to the Council and to the Local Government Board, but be published for the public information in the local newspapers. A case recently came to light in which an elective auditor had been denied access to the accounts of an electric lighting and a tramway undertaking. For what reason, we cannot say; but the act allows an inference. Following the systematizing of municipal accounts, if that is to be the result of the Departmental Committee of the Local Government Board, we shall hope for such provision being made as will secure the independent audit that is so desirable. The question is one which concerns every ratepaying individual, and more especially those numerous joint-stock companies who pay most into the local exchequer, but who have no voice in, or control over, the spending.

The Edinburgh Brewery Well Case.

Once more the Scottish Law Courts are engaged upon the question of the pollution of that brewery well whose water is stated to have been at one time eminently suitable for the production of "Edinburgh Pale Ale." As long ago as last June, after hearing evidence which extended over five days, Lord Ardwall, in the Outer House of the Court of Session, decided that this pollution was caused by the Edinburgh and Leith Gas Commissioners allowing coal-gas tar and water-gas tar to escape from the gas-works in New Street; and the plaintiffs (Messrs. James Muir and Son, Limited) were awarded £3730 damages, and also their costs. Against this finding, the Gas Commissioners are appealing; and on three days last week the case was argued before the Second Division. The matter is not concluded yet; but meanwhile the contentions of Counsel on both sides, as set forth in our lengthy report of the proceedings, are worthy of perusal. The manufacture of gas at the New Street Works ceased in April, 1904; and early in the following July the carburetted water-gas plant was removed. It was towards the end of the latter month that the pollution of the well was noticed; and the allegation of the plaintiffs was that it was caused through carelessness in the emptying of the tar-tanks during the process of dismantling the water-gas plant. The Commissioners therefore directed their attention to combatting the case that the pollution was caused by water-gas tar; whereas they hold that the issue was subsequently decided against them on wider grounds, of which the pleas gave them no notice. It is admitted that if the trouble arose from water-gas tar, no one but the Commissioners could have caused it; but if coal-gas tar was responsible, it is urged that it might have come from another source. It may be pointed out that after the judgment was given, and again last week, our Scotch Correspondent expressed the opinion that there was a great probability of Lord Ardwall's finding being upset, owing to the fact that the decision rested almost entirely upon grounds which were not pleaded by the plaintiffs.

Mond Gas in South Staffordshire.

The works of the South Staffordshire Mond Gas Company have now been in operation for nearly a twelvemonth; and therefore particular interest attaches to the report for the year ending Dec. 31 last, which has just been issued. As the distribution of gas to consumers began at the end of April, the period referred to only includes eight months of active operations; and, in view of the magnitude of the undertaking and the obvious difficulties to be overcome, it is not altogether surprising to find there is a debit balance of nearly £9000 on revenue account. It has been found hard, in the initial stages of the concern, to get "any appreciable number of customers;" there being a very natural disposition on the part of prospective users to delay entering into negotiations until satisfactory proof was forthcoming that a constant supply of gas could be relied upon. Then, again, there was the need of demonstrating practically the economy to be derived from the employment of Mond gas in furnaces for different operations. To this end, furnaces on a working scale have been erected at the works and placed at the disposal of manufacturers, who have sent their own men and materials for the purpose of carrying out tests. The Company have been able to make arrangements for supplying the South Staffordshire Mines Drainage Commissioners with gas for firing the boilers at their pumping-stations; but the conditions set forth in the report—that works of this magnitude must have a certain load-factor below which the plant cannot be properly manipulated, and that the Company can cut off or vary the supply at any time—imply that the securing of this business has been based more upon considerations of convenience than the carrying through of a really profitable commercial transaction. When next year's report comes to be issued, there will probably be a better opportunity than now of judging how far the aspirations of the Company are likely to be realized; but meanwhile the shareholders will no doubt derive some amount of consolation from the fact that two of the largest works in Walsall and Wolverhampton, which have recently been supplied with the gas for power and heating, are said to be so satisfied that the proprietors are extending its use.

Municipal Audits.

The Plymouth Chamber of Commerce held a meeting last week to consider the question of municipal trading, especially in reference to the auditing of municipal accounts. As Plymouth has been recently placed under what is regarded as the disability of a Government audit, the opinion on the subject of the commercial men of the town is not without interest; while the fact that the Chairman of the Finance Committee of the Town Council was in the chair is not without significance. One result of the special attention which has recently been given to the subject has been to convince most business men that the more rigid the audit the greater the hope of checking extravagance and illegal expenditure on the part of corporations. The meeting therefore endorsed with little demur the recommendations of the Joint Parliamentary Committee, in favour of a uniform system of audit by officers appointed with the sanction of the Local Government Board, and not subject to dismissal except with the Board's consent. Much

emphasis was laid on the desirability of the auditor having power to express an opinion as to the necessity of reserve funds to meet the depreciation and obsolescence of plant, and the adequacy of any provision of this kind which might be made. This would be a very valuable provision in municipal audits, especially if some means could be devised whereby the opinion of the auditor could be enforced in cases where the depreciation and reserve funds were found to be inadequate. But the members of the Plymouth Chamber of Commerce do not appear to be anxious that coercion should be applied to the Corporation. One of the recommendations adopted was that the power of surcharge possessed by Local Government Board auditors should be abolished. The Chairman of the Finance Committee argued that the present system of surcharges is a mere waste of time. It prevents possibly some quite trivial expenditure of an illegal character; but it does not stop unwise and wasteful outlay of which there are abundant means without infringing the law. There is no doubt a good deal to be said for the view that an extravagant public body will easily find or create means of extravagance. We are not sure, however, that the power of an auditor to surcharge its members with unlawful expenditure is so useless as is supposed. The mere fact that such power exists has a sobering influence upon the spendthrifts who are so ready to make free with other people's money.

German Coke for Blast-Furnaces.

The fact is being commented upon that every week this year at least one shipload of about 2500 tons of German coke has been delivered for consumption in the blast-furnaces in the Barrow-in-Furness district at a price of 20s. 9d. per ton. According to a correspondent of the "Standard," North-country coke-makers are quite at a loss to account for the Germans being able to supply the coke at the figure named, as this is as low a rate as fuel can be supplied at to that district from the Durham coke-ovens. In the absence of any better explanation, Durham colliery agents are driven to the conclusion that, having supplied their home markets and the neighbouring neutral markets at remunerative rates, the Germans are dumping in England a surplus which would otherwise be left upon their hands. It is pointed out that some months ago a large quantity of first-class Durham coking coal was bought by the Germans; but people in the North decline to admit that it is possible to convert this into coke and reship it to the West Coast at a profit, though the great superiority of the German process of coke-making over the English is granted. At any rate, the question is an important one from the Durham coke manufacturers' point of view; for the agent for a large colliery, producing just over 80,000 tons of coke a year, has estimated that the displacement of this output by German coke would represent a loss to the district of over £62,000. The correspondent in question concludes with an expression of opinion that any considerable increase in the importation of German coke would have a serious effect on the Durham coal trade; the comparatively small quantity already brought over having made an appreciable impression on the market.

Rejection of the New Inverted Incandescent Gas-Lamp Company's Appeal.

The Court of Appeal, composed of the Master of the Rolls and Lords Justices Romer and Cozens-Hardy, have been engaged for several days in hearing the appeal of the New Inverted Incandescent Gas-Lamp Company, Limited, against the judgment of Mr. Justice Joyce, in the action brought by them against the Globe Light Company, Limited. It may be remembered that they sought to obtain an injunction to restrain the defendants from selling incandescent gas-burners made in accordance with the invention the subject-matter of patent No. 5769 of 1900, granted to Josef Bernt and Emanuel Cervenka, and from making, selling, or offering for sale burners differing only colorably from the invention, and from in anywise infringing the plaintiffs' patent. The defendants denied infringement, and, among other defences, alleged want of novelty and prior publication. The hearing commenced on the 18th of May last, and extended over several days. His Lordship gave judgment on May 23, to the effect that the defendants had not stolen or borrowed anything from the plaintiffs' specification; and he therefore dismissed the action, with costs. Judgment was delivered on the appeal yesterday morning, with a similar result. A report of the judgment will appear next week.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 443.)

THERE is hardly anything to note in the way of change in the general position and outlook of things on the Stock Exchange last week; for the ruling factors remained unvaried. Business was very quiet in the aggregate. The fortnightly settlement was the chief event—a process which in at least one speculative market is believed to have been attended with some difficulties. The most pleasant feature of the week was the continued demand for securities of the highest class. Most of the rest were dull and drooping—a condition which lasted right up to the close. In the Money Market, the stringency, which we last week noted as giving no sign of relaxing, was as stiff as ever, and short loans commanded high rates; while terms for discount are equally unbending. Business in the Gas Market was a good fair average in point of volume; but it was not fairly distributed through the list—the big issues had the bulk of it. Changes in quotation were neither numerous nor large; but they were all in the upward direction, except that *ex div.* adjustments fractionally disserved the quotation of Gaslight and Coke issues. The ordinary was pretty active on some days though quiet on others, and prices were fairly steady—varying from 100¼ to 101¼ *cum div.*, and from 98 to 98¾ *ex div.* A small amount was done in the secured issues. The maximum marked 90 *cum div.*, and 87⅞ and 88 *ex div.*; the preference 112 *cum div.*, and 109 and 109½ *ex div.*; and the debenture stock was done repeatedly at 89, the top price. South Metropolitan was less active than last week, and was unchanged at figures which ranged from 130¼ to 131½. The debenture marked 87½ and 88½, and then advanced a point. Commercials were left quite unnoticed until the close, when one deal was marked in the 4 per cent. at 118½. Business in the Suburban and Provincial group was practically next to nothing. Bournemouth "B" was marked at 18, Brentford old specially at 262, and South Suburban at 124¾. On the local Exchange, Newcastle had a slight advance. In the Continental Companies, there was a moderate amount of business marked in Imperial, which was firm without any further advance. Stock changed hands at prices ranging from 238 to 239. Nothing was done in the debenture; but the quotation had a fractional gain on *ex div.* adjustment. Union was in good favour, and was repeatedly dealt in at from 132 to 133; but one parcel was let go at 130½. The preference changed hands at 147½. European was not dealt in. Among the undertakings of the remoter world, Bombay marked 6 15/16 and 7 1/16, and Cape Town 17¼. Buenos Ayres was done at 12⅝, and the debenture advanced a point without business done. San Paulo had a fractional rise. Monte Video was done at 12 and 12¼, Primitiva ordinary at from 7 1/16 to 7¼, ditto preference at 5 3/32 and 5¼, and ditto debenture at 98¾. River Plate was rather active, and changed hands at prices ranging from 12⅞ to 13⅛.

The closing prices are shown in our Stock and Share List on page 443.

ELECTRIC LIGHTING MEMORANDA.

Further Illustration of Sham Electricity Accountancy—The Financial Depravity of Stepney and Poplar—Spurious Net Profits Swallowed up by Increased Public Lighting Costs—A Mayor's Comparison—Marylebone's Increasing Burdens—A Paying Continental Municipal Undertaking.

IF the Departmental Committee to whom the Right Hon. John Burns has referred for inquiry the question of municipal accountancy go thoroughly into their work, they will be made aware of the existence of a stupendous amount of base finance in connection with municipal electricity supply. It is a direction for investigation in which the farther one gets, the more fruitful becomes the illustration of the abandonment of faithful method for the adoption of deliberate delusiveness. From time to time, we have followed up the series of articles in the "Standard" on the question of rates in London; and if there is one more striking feature than another in these articles, it is the consistency with which the writer has, in the case of the boroughs owning electricity undertakings, to point to delinquency in the departments' accounts, and to the enormous claims made upon the ratepayers, through the public lighting, for support to the business of those concerns. The trouble appears to have no ending; its growth is unceasing. Stepney and Poplar have been under review—both boroughs being among the most heavily rated in the Metropolis; the latter in fact (industrially dependent though it be), being, with 12s. in the pound, at the top of the list of London boroughs in the amount of its rate. Stepney has been dealt with first; and 8s. 5·7d. in the pound is the rate under which the ratepayers are groaning. The borough debt has increased in sixteen years from £103,779 to £520,354. In the "Electrical Times" tables, it is seen that the total expenditure on the electricity undertaking at the end of the last financial year was £238,061. While this burden of the borough's total debt has been in process of development, the population has only increased from 285,000 to 303,000; and this has been mainly due to alien immigration. The rateable value, too, has been increased from £1,236,823 to £1,440,137; and, having regard to the composition of the population, there cannot be the slightest doubt that this increase in value has been set against industry, upon

which the district so largely depends for the sustenance of the dwellers. It was towards the end of January that the articles on Stepney appeared; and the writer then stated that "the Commercial Gas Company are even now appealing against their new assessment; and there is no reason to wonder why they should do so, for the assessment of their undertaking has been increased one-third." Not only is it true that those industrial Companies who pay most have no voice in the spending, but the Gas Company have to suffer the loss of business through the public lighting and competition generally, and have to contribute largely to the maintenance of an unnecessarily expensive system of public lighting—a system which has been almost entirely responsible for the increase in the cost of lighting of Stepney streets from £12,953 to £21,231.

In several ways, in cnnnection with the Metropolitan electricity undertakings, it has been shown, with (for the municipalizers) exasperating frequency, how these concerns are coddled by benevolent and secret transference of expenses to other departments. The Stepney exposure goes even further. Here the charge has not been satisfactorily cleared that there has been a liberal amount of relief given by the Highways Committee (and therefore through general expenditure) in the matter of reinstatements of footpaths where installations are made; and those surely are a fair charge directly on the undertaking. The compensation award in the purchase some years ago of the County of London and Brush Electricity Works supplying in parts of the Council's area was, by a device which would make a fairly long tale, kindly sequestered from the electric lighting undertaking, so that it has never been a liability on it, though a capital expenditure. If all charges were properly made against the undertaking, the "profit" of £5845 which is carried to an appropriation account, and which is about equal to a penny in the pound, would be considerably reduced. The £5845 is the published "profit;" but in the appropriation account, there is set against it £1000 for consulting engineer's fees, and £202 stamp duties, law costs, and other expenses in connection with loans! This alters the aspect of the "net profit." Then, if the ratepayers appreciate that, through the electricity concern, they are paying £8278 more than they were doing previously for public lighting, and that full charges in other respects are not made against the undertaking, but are entirely neglected or muddled away in other accounts, then they will understand what a "productive" concern this has been for them. Councillors who deliberately mystify are not worthy the confidence of the ratepayers.

The accounts of the Poplar electricity enterprise have been so fully and specially dealt with recently in these columns, that, to an extent, it would be merely reagitating the turbid streams of financial iniquity and inept management in connection with the concern and the public lighting, to follow the commentator of the "Standard" in his scathing indictment of the public administration. In any borough where the retention of industry means the retention of all that contributes to life and prosperity, economy should be jealously guarded; but what is to be said of the prudence of the Poplar administration when 12s. in the pound is deemed insufficient to meet all liabilities? The growth of the borough debt from £41,683 to £529,300 since 1888-9 is solid testimony to a dissolute policy, which has evoked admonition from that paragon of virtue the London County Council. Among the extravagancies is the public lighting, the cost of which has swollen since 1888-9 from £5867 to £12,702—the increase since 1899-1900 having been from £6468. "The borough," the "Standard" says truly, "could be as well lit with incandescent gas as it is with municipal electric light, and at half the cost. . . . The Borough Council has saddled the ratepayers with a costly electric light undertaking, which must be kept going somehow, even at the cost of depriving the ratepayers of enjoyment of the advances of scientific invention." The cost of public lighting has doubled since the electric lighting works were started; and the loss on the undertaking for the year ending March last was £1271. Under-assessment of the undertaking, deferred repayments of loans, inadequate depreciation, and diversion of charges legitimately chargeable to the undertaking, go to make up, with the doubling of the cost of public lighting, a weighty and irrefutable case of the failure of the undertaking to produce the blessings that were signalled by the promoters of the undertaking some half-dozen years ago.

Disingenuousness to make good a bad case is not what one expects from the Mayor of a London Borough; but we unreservedly assert that Mr. Thomas Burnell, the Mayor of Shoreditch, has either adopted that method of putting a fresh complexion on a bad case or of giving publicity to figures the full import of which he does not personally understand. Attention was directed in the "JOURNAL" for Jan. 23 to the reflections in the "Standard" articles upon the Shoreditch electricity concern, and upon the large increase that has taken place in the cost of public lighting since 1888-9. In that year, it was £5493; while in 1903-4, it was £14,400. His Worship the Mayor has, in the columns of our morning contemporary, tried to dispose of the matter in a manner that may satisfy the uninstructed layman, but the initiated will have no difficulty in seeing through the pretence with which Mr. Burnell attempts to shroud a lamentable piece of extravagance, incurred to supplement the insufficient resources (independent of public lighting) of the electricity undertaking. He states that in the year 1896, before Shoreditch had the electric light, it cost £5890 to provide the borough with gas-lamps, giving a total of 33,955-candle power; so that the cost per candle power per annum in the borough was 3s. 5½d. In 1904, it cost £14,174 to provide 340,710-candle power (part electric, part gas), which is a cost per candle power of less than 10d. His Worship's want of candour, or of the officials who supplied him with the figures, is not commendable, nor is it complimentary to the public or the ratepayers. He does not tell them that in 1896 the gas-lamps in the borough were all of them flat-flame ones; nor does he tell them that—we can speak definitely up to the time of our own investigation in January, 1904—at the beginning of last year so great was the anxiety of the Borough Council to maintain the gulf between the poor flat-flame gas lighting and electric arc lighting, that they had still in use 1047 flat-flame gas-lamps at £3 3s. per burner per annum, while only 66 incandescent gas-lamps were to be found in the borough at the beginning of last year, the average cost being £3 4s., or only 1s. each more than the flat-flame burnered lamps. On the other hand, there were 322 arc lamps, costing about £30 each per annum, or £9660. If these facts had been before the readers of the "Standard," they would have seen that Mr. Burnell was comparing the ancient in gas lighting with the modern in electric lighting, in order to make his point as to the 3s. 5½d. per candle power in 1896 and 10d. per candle power now. The use of this method of candle-power comparison rather than relative efficiency, points to the origin of the Mayor's figures. It is an old electrical trick. Let us look into the matter. We will assume—and it is only an assumption, for the nominal candle powers of arc lamps are never actually obtained, and the actual are very variable—that the arc lamps render a light equal to 500 candles each, or a total of 161,000 candles, for £9660. The 66 incandescent gas-lamps of which we have spoken consumed 4½ cubic feet of gas per burner, and their average charge was £3 4s. Now if the 1047 flat-flame gas-lamps, still in existence in the beginning of last year, had been similarly converted to the ordinary incandescent gas system, reckoning 18 candles per cubic foot of gas consumed, each burner would have given a light of 75 candles, or a total for those 1047 lamps of 78,525 candles; or for £52 7s. a year more than was being paid in the early part of 1904, seven times more light could have been realized by the incandescent method than was being obtained by the flat-flame lighting. The annual cost of the 1047 incandescent gas-lamps would have been, on the then basis of charge, £3350, or only one-third of the amouut that was being paid for the electric arc lighting. If we multiply the 78,525-candle power above mentioned by three, we get an illuminating power (with ordinary incandescent burners and without high-pressure gas) of 235,575 candles, as against the 161,000 candles—allowing the generous 500-candle power per arc lamp—which was being obtained from the electric lamps at the beginning of last year at an annual cost of £9660. Then the question arises whether in the streets lighted by the 322 arcs at this cost of £9660, sufficient and efficient lighting could not have been obtained by 1047 incandescent gas-lamps and 78,525-candle power properly distributed, at a cost of £3350. Although we do not agree with this method of computing the comparative value of the two lights, by working out the cost per reputed candle power, we ask which is the cheaper illumination (based on Shoreditch figures), electric lighting at £30 per 500 candles, or ordinary incandescent gas lighting at £3 4s. per 75 candles. Besides which, the best form of lighting streets is by frequent centres of low illuminating power rather than by distantly-placed high centres of power. Under these circumstances, instead of the figures which the Mayor of Shoreditch advances being a defence, they are really a confession of short-sighted policy, and therefore a reproach to those who have put them forward.

The Marylebone Borough Council appear to be helpless in the matter of their capital expenditure on the electricity works; and they have evidently resigned themselves to the principle that, having put their hands to the electrical plough, there must be no turning back. They started in the business of electrical supply with the terrible award and expenses—amounting to £1,378,692—connected with the purchase of the local undertaking of the Metropolitan Electric Supply Company. On this account the estimated net expenditure has been exceeded by £37,184. The cost of a new generating-station and the changing over of the supply from 100 to 240 volts was estimated to be £540,000; the actual expenditure is now reckoned at £587,062, or an increase of £47,062. Of this excess, £41,000 has been caused by the increase in the cost of the change of pressure. Another increase is a probable bonus of £6552, which will be earned by the turbine contractors (Messrs. Parsons), owing to the greater efficiency of the plant. Then the increase in the price of copper and other things are chargeable with causing increases. Therefore the estimates of expenditure have been exceeded so far by £84,246; and, with £38,500 for a site, there is a total burden of £122,746 beyond what was anticipated. This will increase the charges for capital and depreciation by £7815. On the other hand, to place against the total new expenditure, Mr. Arthur Wright has calculated a saving of at least ½d. per unit on the cost of generation, which (if the estimate escapes the fate of its predecessors) will amount to a saving of £15,200 a year. But this saving will, we imagine, be very much required in connection with the capital and other standing charges, especially as the London County Council are to be asked for sanction to the spending of a further £151,162 to complete the scheme.

For instruction in the conduct of their businesses, municipal traders in electricity supply may be advised to go to Leipzig. The Municipality of the town run their undertaking on ordinary

commercial principles, and make it pay. The charge for public lighting is 4½d. per kilowatt-hour, 8¾d. for private lighting (with a rebate to theatres), and 2½d. for power. The estimates for 1906, after meeting interest and capital amortization, show a profit of £13,500. In this case the undertaking is made self-supporting and profitable by not, as is done in this country, relieving the pockets of the consumers at the expense of the rates. After the deplorable revelations in connection with the Metropolitan municipal electricity undertakings, it is refreshing to turn to this example of enlightened municipal management.

THE MANTLE QUESTION IN GERMANY.

THE conference held recently in Berlin to consider the question of forming a price convention of makers of incandescent gas-mantles, failed to accomplish the object in view, though the endeavours in this direction are to be continued. It was submitted by the promoters of the scheme in convening the meeting that it would be quite useless to proceed unless the proposal received the support of all manufacturers; and that it was desirable, in emulation of the policy followed by other trade combinations in their initial stages, that no fresh contracts should be entered into below a certain price between the date of the receipt of the invitation and the holding of the conference. No less than 45 firms were represented at the conference; but the negotiations were not successful, and certain large and small producers admitted having not complied with the request in regard to dealing with fresh orders.

The problem of a price convention having now been dismissed from consideration for the present, attention may be drawn to the mantle question as it affects the German Incandescent Gaslight Company (Deutsche Gasgluhlicht Gesellschaft Auer) and its competitors, as a result of the reduction in the price of nitrate of thorium. It was recently stated, apparently on behalf of the Company, that the genuine Auer—the name Welsbach is rarely used in Germany—mantle, termed Degea, is produced from a material which is not obtainable on the market. This is the Auer fluid, which is made by Dr. Auer von Welsbach, and exclusively delivered to the Auer Company; and, as a consequence, the latter Company are claimed to be independent of speculation in the thorium market. In reply to this statement, a competitive firm points out that the recipe of Dr. Welsbach for the production of mantles has been common property for a long time past; and that it only depends materially upon the more or less quantity of thorium placed in the mantle, according as to whether cheaper or better articles are required by customers. There are no longer, it is said, any secrets in the manufacture or in regard to increasing the illuminating power. The methods employed by individual firms to augment the durability or lighting power probably differ by a little from each other; but that is all. The principal consideration is the quality of the thorium used, and the correct proportion in which the other components are added to it. It is, however, well known, the rival Company conclude, that the thorium factories included in the Nitrate of Thorium Convention produce a manufacture which is at least equally as good as that made by Dr. von Welsbach.

The comments of the rival Company, whose observations were supported by a leading Berlin newspaper (the "Berliner Tageblatt"), with additions of its own, have evoked a direct reply from the Auer Company—as the German Incandescent Gaslight Company are briefly termed. In the course of this response, the Company state that all their brands are actually produced from Auer fluid, which is made in the factory at Atzgersdorf, near Vienna, which was founded by Baron Auer von Welsbach. Auer fluid, which has particular properties of its own, is not to be obtained in the market. The Company contradict the assertion that Auer fluid is used only for the manufacture of a portion of the output of Degea mantles, and that thorium is obtained from the Thorium Convention for the manufacture of the largest portion of them. On the contrary, since the existence of the Company not a single mantle has been made and placed on the market that has not been produced by the use of Auer fluid; and the Company assert that they have never employed in the output of their mantles the thorium turned out by the Convention, and that they also propose in the future only to use the genuine liquid in question. When difficulties arose in regard to the export of monazite sand three years ago, owing to the measures adopted by the Government of Brazil, the Auer Company purchased a large quantity of thorium from the Convention; but they did not use it in the manufacture of mantles. A small portion was disposed of to other makers, while the largest quantity was sold again at a considerable profit. The Company further state that they have never procured monazite sand from Carolina, as has been alleged, or from other countries, as the entire production, as already set forth, is declared to be exclusively turned out by the employment of Auer fluid.

It is admitted that the Auer fluid represents a secret of manufacture. But the statement that only this liquid is used by the German Company is said not to preclude the purchase of thorium from the Thorium Convention by the large, special factories that are owned by the Company or Dr. Auer von Welsbach. It would therefore be interesting if the Thorium Convention itself would throw a little light on the question.

THE TREND OF GAS INVENTION.

To invention there is no end. If there were, progress in those material things that tend to benefit mankind would be stayed. The range of invention in which we are individually concerned is beyond the comprehension of any single mind; but the range of invention in which collectively as an industry we are immediately interested has its limits. Otherwise, there would not be the pleasure that is annually found in making a survey of the invention pertaining to that industry as adumbrated in the patent specifications that have been published, and have received notice in our "Register of Patents," during the previous year. As the notes are completed for the present article, and reflection precedes the writing of the year's history of the invention good and indifferent, the thought arises how this same history year after year shows not only the diversions that are being made in connection with production and utilization, but how methods that were once approved and adulated on the score of efficiency are left behind, and their further improvement is no longer of sufficient importance to warrant the expense and trouble of an application for letters patent. Invention and construction are synonymous. But constructive though invention is, it is also destructive; for before the new the old falls. And this is seen in these annual reviews.

The history of last year's patent publications is encouraging as well as instructive. In variety, it was not extensive; but it has some impressive features both in subject and omission. In the number of patent specifications that were considered of sufficient merit for notice, the record for the new century was made. The total number of which abstracts were given was 322; and the nearest approach was 1903 with twelve less. In 1904, there were 298; in 1902, 240; and in 1901, 259. But the native inventions exhibited a marked increase, while those from abroad presented a falling off. The British inventions numbered 202; while those from beyond our own shores only totalled to 120—the respective figures for 1904 being 162 and 136. While we are pleased to see invention which will assist progress from abroad, it is only natural to find gratification in these signs of increased activity at home. Among the inventions from abroad, it is remarkable that there are extremely few from America, and only two or three from our Colonies. Passing from number to subject, while it must be conceded that the events do not move so rapidly that a single year's specifications of inventions speak determinately of the shaping of the ways, they are at least indicative of the destination towards which the greatest number of eyes are directed. We turn to our notes on manufacture, and find that a great amount of energy is being expended in the charging and discharging of horizontal retorts from one side of a bench; but the subject of inclined retorts only obtains mention twice in the whole course of the year. One inventor, however, is hopeful of making a success of a system of short twin inclines, with a central charging arrangement. Purification receives rather more prominence than it has done for some time past; but here again it is not any new system—that is, fundamentally new—that urges attention, but improvement of apparatus for securing better performance. Producer gas is a fertile field; and the activity there is the warning to those of the gas industry who are hanging behind to advance to the competition for power before the competitors become too strongly entrenched. In the distribution department, improvement in meters, and adapting them for fresh service, have been inviting the exercise of much creative faculty. In utilization, incandescent gas lighting tops the list quantitatively; but the question of enriching gas is altogether neglected. The inventor finds the expenditure of time, intelligence, and money unprofitable in providing further means for accomplishing an object that each succeeding session of Parliament buries deeper and deeper among those things that have been, and that the daily progress of incandescent lighting makes less and less a necessary concomitant of gas supply. Not less conspicuous through absence are flat-flame burners—not a single burner of this type appearing as the subject of improvement calling for protection.

CARBONIZING—CHARGING AND DISCHARGING FROM ONE SIDE OF THROUGH BENCHES.

Sectionizing the specifications, gas manufacture has first place. It is noted that, in the classification made in our notes, there are 108 patents in this section, of which 71 are of British origin, and therefore 37 is the number of introductions from abroad. It will be remarked as we proceed how prominently the horizontal system stands in the attention bestowed on carbonization; and there can be no doubt that the economy in structure and work that the successful charging and discharging of retort-benches from the one side has established has been the incentive. Regenerative settings for retorts have been the subject of patents; two British inventors and three in other countries having been engaged in this direction. And the specifications mostly, if not entirely, refer to the improvements as applying to horizontal settings. [In order not to make a separate entry, it may be noted here, in conjunction with retort-furnaces, that one abstract of a specification dealt with Wilton's improved blast-chamber or tube furnace.] Among other propositions was one for new doors and frames for the flues of retort-settings; a lid-closing device for all kinds of retorts; a new retort scurfing-bar; and two British firms and

one American inventor came out with travelling-platforms for retort-houses, which indicates that, for small houses, the system of open subways is finding patrons. The growing use of overhead coal-hoppers, it is observed, apart from the patent specifications, produces a desire for improving the exits and the method of actuating the slides; and, in the specifications this year, coal-hopper slides have one representative. To effect the thorough mixing of coals of different sizes in the hoppers feeding inclined retorts, a device which has to be applied above the hoppers has been brought to notice. This reference brings us into contact with the specification of Redman's system of inclined retort-settings, in which short retorts are placed this wise ⅄, with central charging provision and device at the top of the bench. The arrangement of the retorts is not novel, as Mr. Alfred Kitt made a similar proposal in 1889. But what Mr. Kitt did not do was to make his scheme of setting successful; and that Mr. Redman (who, when he set to work upon his conception, had, we believe, no knowledge of Mr. Kitt's proposal) claims that he has done by the details of the setting covered by his recent patent. Though there are several engineers investigating the merits of the vertical system of carbonization, only two patent specifications in this line were under notice during the year. The prospect is that, in the current year, there will be more life in this direction. But there is and must be—it can hardly be avoided—a close treading in footprints already made. One of the two specifications referred to had application to the Dessau system.

This brings us to what is undoubtedly the most interesting part of this review. Reference has been made to the superiority in numbers of the home specifications in comparison with the importations; but, in alluding to the spurt that we find in retort charging and discharging machines, it must be confessed that the original success abroad of the application of coal-projectors and charge-expellers on one side only of a bench of 20 feet throughs has animated inventors in this country to produce other means of performing the same functions. It has to be left to the verdict of practical experience to say whether improvement or equality has been effected. The ideas of projecting coal into a retort and of ramming out the charge have never been claimed to be new by those who first, and within recent years, successfully subjugated the ideas to methods; but what they have claimed is that—most ingeniously, it must be acknowledged by everybody—they contrived mechanical ways of perfectly achieving the objects. De Brouwer at Bruges and the Engineers of the Paris Gas Company at La Villette were almost simultaneously projecting coal into retorts truly and well. At La Villette, too, they were then discharging the retorts by a telescopic ram, and at Bruges work was also proceeding in the perfecting—by the collaborators Jenkins and De Brouwer—of a ram for dealing with the spent charges. Though simplicity has won in the race, and complication has been beaten as it ever will be, we say that last year's patent record is a compliment to both Bruges and La Villette. The work of charging and discharging from one side of a bench, once being a proved success, was bound to make headway; for it means so much where such a system is suitable: Machines on one side of the house only, coal elevating, conveying, and storage plant on one side of the house only (no transverse conveyors or second set of hoppers for the one bench), coke-conveyors or other methods of removing coke on one side only, and producers on one side only. Result: Both capital and working economies. These are economies that appeal strongly to the responsible engineer. Thus it comes about that of the eleven specifications dealing with charging and discharging machinery, the majority treat of the projection of charges and their expulsion from one side of the bench. Appended to the specifications of projectors are the names of West, Toogood, Graham, Eitle, and Fowler. The last but one is a well-known Continental inventor, and the last-named hails from Cambridge, Mass. In discharging-machines, the Hunter and Barnett (South Metropolitan) hydraulic ram, the purpose of which the inventors describe as being "to prevent the wear and tear on the retorts occasioned by the present means of discharging," was noticed; and others were the patents of Messrs. R. Dempster and Sons and Mr. R. M'Kinlay. Mr. John West also showed a machine for optional use as a rake or a ram. A proposal came from Paris for the mechanical removal of spent charges by means of a scoop; the scoop being made as nearly as possible the internal cross section of the retort. It is not expected that such an arrangement will displace the new simple method of expelling the charge by pushing. There are obvious difficulties in ordinary retort-houses of drawing spent charges by a scoop, to say nothing of the mechanical and scoop hazards that every engineer would be led to suspect. The subject of spent charges allows us to say here that there was one specification dealing with conveyors and elevators of the gravity bucket type, and another referred to the quenching and carrying of coke.

From Hydraulic Main to Gasholder.

If there was nothing more to be said upon the subject of the specifications referring to gas production, the foregoing is of such salient interest, marks such a distinct trend, and shows so many active inventors in the field, that we should have been satisfied with the record. But there are other matters claiming interest. Four specifications have relation to the hydraulic main. One inventor proclaimed the provision of means for forming a separate hydraulic seal to each retort or group of retorts during such time as they are being drawn or charged, or are out of action, and yet allowing of the dispensing with the seal when the retorts are in ordinary working operation. The publication of the specification brought Mr. George Helps and Mr. J. Ferguson Bell on the track of the holder of these letters patent. A second one also provided for removing, restoring, and adjusting the seal on the dip-pipes; and a third was for the regulating of the seal. A new hydraulic valve is one which will permit gas, whenever required, to pass, but stop the flow of the tar and liquor when a greater seal on the dip-pipes is needed. Condensers only came under notice twice—one of the specifications relating to a four-way valve for reversible condensers and other plant.

Purification stood well numerically—24 specifications being abstracted in the course of the year, of which 19 had their genesis in this country. Specific reference to the whole is not necessary. Luteless covers were the subject of a single notice; but valves and the new forms of grids bulked more largely—the latter accounting for five specifications. Three arrangements for extracting tar and other impurities from gas, a method of desulphurizing lighting gas, and a special construction of wooden gratings for scrubbers, were among other propositions. No less than eight of the specifications described washing and scrubbing proposals.

Among miscellaneous notices were two referring to governors, one to grabs, two to gasholder tanks, and one to the spiral-guided type of holder. In the case of the tanks, both projects in construction are intended to confer the boons of greater durability and cheapening; and the one relating to spiral-guided holders is to obviate the disfigurement of the sides of the holders.

Producer and Other Gas Manufacturing Systems.

Still in the region of manufacture, we have grouped together some 43 specifications dealing with producer gas, water gas, and other gas manufacturing proposals, auxiliary appliances, and means for testing. Of these 43, no less than 28 refer to producer gas plant; and 16 of the 28 are natives. This great activity signifies much; and the gas industry should regard this feature of the tale of inventive activity with some respect, and make absolutely certain that what it presages is clearly grasped. It shows that there is a great demand for cheap gas for industrial use, that the makers of producer plants and gas-engines recognize it, and that the managers of industrial establishments are finding that they can produce a gas good enough for their power purpose by private plants at less cost than is charged for illuminating gas, in cases where special concession is not made. It also indicates that inventors are pressing forward in the removal of the difficulties that have clustered about the use of unrefined producer gas in gas-engines; and the appearance of several suction-gas type of plants among the number also shows that simplification, ready adaptability to both small and large powers, capital economy, and diminishing space for plant occupation, are among the things for which there has been sedulous working. It is not the slightest use ignoring this life among competitors; and recognition will be the spur to consideration as to how best to meet the extending rivalry. Two washing, cleaning, purifying, and cooling proposals for producer gas were among the apparatus to which notice was given in the year's "Register." Special valves for the mains of coke-ovens or producer gas plants were also brought before readers.

But the gas-manufacturing systems were not exclusively of what is commonly known as the producer-gas type. There were three projects for manufacturing illuminating gas, one of which it was specially pointed out was applicable also to the production of power gas, and another included a system of continuous coal feeding to a type of horizontal coke-oven. For the purpose of meeting the requirements of would-be gas consumers where gas is not distributed, or for use in vehicles, a system of treating gas "to obtain an illuminating gas in a highly compressed form suitable for transport," was among the suggested means of developing the utility of gas. The attraction of water gas to inventors appears to be on the wane, unless such perfection has been obtained that there is little room for improvement. Only four specifications called for notice in the past year; and but one of the proposals had birth in this country. As being kindred to gas manufacturing systems, it may be mentioned here that one patentee described a method of obtaining bye-products in the dry distillation or gasification of fuels, and two others offered ideas for testing gaseous mixtures.

The Distribution Department.

If we exclude meters, there was a paucity of invention in this section. Including the meters, there were only 41 specifications noticed; and excluding them, the number drops to nine, four of which came across the sea. The jointing of pipes has received some attention. One patentee suggests a mode of testing them; while one well-known American specialist in the jointing and coupling of pipes shows how to stop the leaking of pipe-joints and collar pipe-couplings, and he has likewise a fresh device in the way of a coupling for spigot-and-socket pipes. A means of connecting services to mains was also specified; and a plan of automatically shutting off gas or water in cases of fires, explosions, or other accidents may prove to be a serviceable contribution. Gas pressure had unusual notice—small though it was—during the year. While on the one hand, there was a system for increasing and equalizing the pressure of gas, a further one provided for the reducing of the pressure in supply-pipes to lamps. An apparatus for measuring the pressure of gas was also described.

Meters have yielded prolifically; and here we find that, of the 32 abstracts of specifications given (all told), only eleven came from other countries. It is the effect, if we are not mistaken, of less competition abroad than in this country. Competition will not allow of a rest-and-be-thankful policy; and superiority, in some respect or other, for which competing manufacturers of goods are ever searching, will always command patronage. Among the descriptions of changes or improvements in ordinary meters was one enabling the conversion of wet meters into coin-freed wet meters; and another comprised a new method of regulating the pressure of gas on entering or leaving meters. An illuminating device connected with meters was illustrated and explained; and a very useful appendage for the testing-room is a meter prepared for comparing the illuminating effects and consumptions of different burners. Meter indices only asked for a single notice; but from meters novel ideas are springing. This year's examples are a counting mechanism, a bill-delivery mechanism, and a calculator of the amount to be paid. Upon the prepayment meter hang fourteen specifications, only three of which came from abroad. Most of them dealt with the improvement of mechanisms; but outside the main construction are gathered an attempt to prevent the fraudulent use of coin-freed meters, a padlock for use on the money-boxes, a change-giving mechanism, and a special cock for use with prepayment meters. The "Rotary" meter has been the subject of improvement, calling for two additional patents.

Utilization of Gas.

If the great accumulation of patents that we have to notice year after year which come under the accommodating head of "incandescent gas lighting" were in every patented particular of any real value, then we should say that surely incandescent gas lighting must now be incapable of further improvement. But of these patented articles, few are heard of again. With them it is a case of the survival of the fittest; and the "fittest" at the present time do not, good as they are, lead us to think that the ultimate step in improvement has been taken. Those who manufacture are like-minded; their prosecution of research, and their obtaining of protection as they proceed, are confirmatory of the statement. This year's patents contain several that are good; the names of the patentees are a guarantee. But of the majority, it is hard to say that each one contains an improvement upon what has gone before. For what vast excellence would 81 different improvements upon pre-existing conditions represent in incandescent gas lighting! That was the number of the incandescent lighting specifications of varied subject that were dealt with during the year, out of the 158 patents noticed in the general section of utilization. Of the 81, no less than 50 saw the light of day in this country. What a difference compared with the time when there was not a free market for burners and mantles in this country! Both in burners and mantles and in auxiliary arrangements, British patentees stand well in point of number. In all the well-known methods of producing high-power illumination by incandescent mantles, there have been fresh suggestions.

There is still a tendency to attempt to make advance without the intervention of a compressing plant by introducing some simple means by which the lamp itself will raise to the needful extent the pressure of the gas or air; and the air supply is undoubtedly the favourite direction of investigators. An improvement in compressing plant was also described. A novel suggestion for shaping mantles from the impregnated material in the position in which they are to be used, was made; but we rather think the idea has not matured as it was hoped. Anti-vibration fittings have been kept before our readers by four or five proposals. New lanterns have had only a couple of representatives; and means of raising and lowering have also been noticed.

Coming to ordinary lighting, the remarkable popularity of the inverted lamp has been productive of many patents—no less than 28 associated in some way or other with this system of lighting were noticed, and 21 of them were home productions. Among the sundry fittings, were a pilot light within the bunsen tube, a new railway carriage lamp for incandescent lighting, and three "dust retainers or arresters" for introducing into incandescent lighting fittings. There has been some honest work on mantles; and there has been sufficient to show that inventors are still trying to get off the only so far successful track. There are attempts to improve the durability of mantles by different methods of preparing the fabric—one proposition being the employment of quartz filaments. There have also been ideas for getting away from the conventional form of mantle—one being a comb or screen made of oxide of magnesium metal, or some other appropriate material. Then there is offered an indestructible filament for gas and electric lamps, composed of lime, silica, alumina, or magnesia. Self-lighting mantles, at one time so popular with inventors, have fallen into desuetude. Thus in the fabric and other material, and in the form of mantle, the invention of Welsbach is being attacked in the hope of superseding it. However obtained, if greater efficiency in any respect can be realized, then it will be royally welcomed. After all that can be said about the thousands of inventions in incandescent gas lighting, there is not one that can touch the glory of the central one with which the name of Welsbach is imperishably associated.

In automatic igniting and extinguishing devices, Britishers are now more or less profitably striving with the Continent, from which the lead admittedly came. There were 38 specifications in this line, 17 of which described conceptions of the apparatus for meeting what is believed by the inventors to be a desideratum. The devices include electrical and change-of-pressure means of operation and control, as well as a timing appliance. An acetylene torch for gas-lamps was also noticed. In the sundry inventions in the lighting department, there is nothing special to refer to here, excepting that the old sun-burner was *redivivus* by the patenting of an improvement in it.

There was little patentable invention in connection with gas cooking stoves and fires; and the specifications only numbered fifteen—eleven being British. They comprised: Four stoves, a stove-governor, an air-regulator, a griller, six burners, a new gas-fire fuel, and a suggested combination of gas and "slow-combustion combustible bodies," by which "greater heat" for a less consumption of gas is to be obtained.

The animation in suction-gas plants has already been remarked upon; and therefore, in dealing with gas-engines, it is only necessary to say that of the eleven specifications that came under review eight were British and the rest came from abroad. They all alluded to improvement merely in parts. There was one which showed how to effect the ignition of gas of low calorific power in engines; and another described how to maintain the supply of gas to engines at practically constant pressure. There was one importation of a gas-turbine; but the successful gas-turbine is long in coming.

Photometry.

There was little doing in this department, but that little was important, as it includes Mr. Charles Carpenter's burner, which is known in the notification of the Metropolitan Gas Referees, and in the Bills in Parliament proposing its adoption for testing, as the "Metropolitan Argand Burner No. 2." Mr. G. C. Trewby had an interesting specification of photometric apparatus; and Mr. Walter Grafton's latest test-burner was also described.

Bye-Products.

Less than a dozen specifications cover the section of bye-products; but year after year there does not appear that activity in connection with the secondary products that we should like to witness. Sulphate of ammonia saturators were under description twice; a process for extracting ammonia from distillation gases was noticed; and the treatment of spent purification materials for the recovery of useful products was the subject of two specifications. The distillation of tar claimed two references; and one sufficed for the treatment of heavy tar oils for the manufacture of pitch or a special kind of tar. In connection with coke, two propositions were made having for their object the production of a gas-works coke suitable for blast-furnace and like use. The preparation of calcium carbide was the subject of the only specification dealt with in these columns having reference to acetylene gas. There were many acetylene generators patented, but unnoticed. They have a strong family likeness.

This is the story of the past year's patent record in the gas industry; and it points out to us the trend of events in manufacture, distribution, and utilization. It is to the retort-house, to purification, to producer gas, and to incandescent lighting that the record directs principal observation. In two of these directions, we may hopefully look for still greater things.

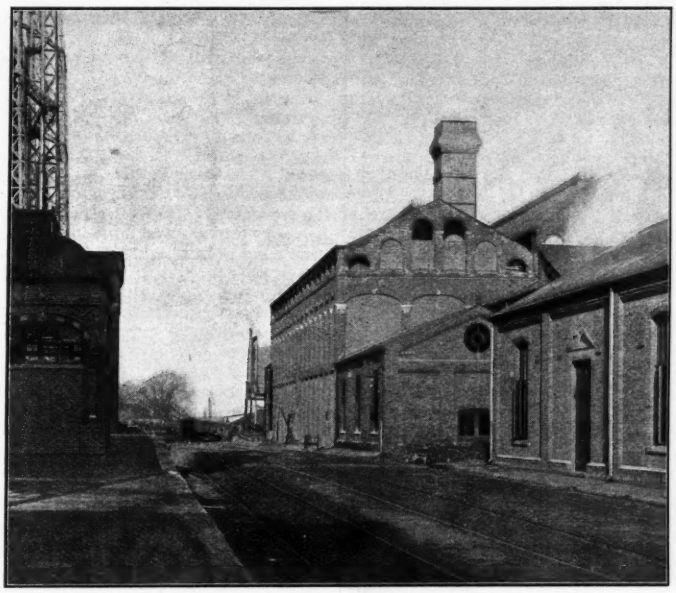
Midland Association of Gas Managers.

In the "Journal" for the 23rd ult., we indicated the nature of the technical business which will come before the members of the Midland Association at the annual meeting to be held in Birmingham on Thursday, under the presidency of Mr. Fletcher W. Stevenson, of Coventry. We learn from the circular issued by the Hon. Secretary (Mr. Charles Meiklejohn, of Rugby) that, in addition, certain alterations of the rules will be recommended by the Committee, under one of which the ex-President of the Association and the President and Hon. Secretary for the time being of the Midland Junior Gas Engineering Association will be *ex-officio* members of that body. The report contains, as usual, a review of the past year's work. At the annual meeting, in February, the President (Mr. T. Berridge) delivered a practical and enjoyable Inaugural Address, Mr. A. T. Harris read an acceptable paper on the reconstruction of a small gas-works, and Mr. H. E. Copp brought forward a suggestion for increasing the usefulness of the Association, which resulted in the question of the formation of a Technical Investigation Committee being referred to a Special Committee. At the spring meeting, a visit was paid to the home of the President at Leamington. An instructive inspection of the gas-works was followed by a drive to some of the show places in the neighbourhood; and the members were entertained at dinner by the Chairman and Directors of the Gas Company. The features of the autumn meeting were Mr. Thomas Glover's lecture, illustrated by lantern slides, on the reconstruction of the Norwich Gas-Works, and a paper by Mr. J. H. Brown, of Nottingham, on "Coal Testing." The report concludes with a reference to the formation of the Midland Junior Gas Engineering Association, and the establishment of classes on "Gas Manufacture" at the Birmingham Municipal Technical School; and the Committee express their appreciation of Mr. Meiklejohn's work in connection therewith. A pleasant incident in the year's work was the presentation of a silver tea and coffee service to Mr. A. Cooke, in recognition of his services as Hon. Secretary of the Association for three years. At the close of the year, the number of members was 108; and there was a balance of £120 in the bank.

A MODERN RETORT-HOUSE EQUIPPED FOR HORIZONTAL WORKING.

Illustrated by the Latest Addition at the Tottenham Gas-Works.

LINED on one side by the range of gasholders (whose increasing dimensions with chronological sequence memorize the extraordinary expansion of the Tottenham and Edmonton Gas Company) and by the new exhauster and power house, and on the other by new meter, carburetted water gas, scrubber, and retort houses, a broad road has been carried from the main avenue through the newly developed portion of the site of the Company's gas-works. The past few years have been marked by some very rapid transitions at these works; and this was seen in the special articles that were published in the "JOURNAL" in the first two issues in December, 1903, under the heading of "Prosperous Tottenham and a Large Modernizing Scheme." To that point, it was shown how—by bold and comprehensive planning on the part of the Engineer (Mr. A. E. Broadberry), with the wholehearted encouragement of the Chairman (Mr. Corbet Woodall) and his fellow-members on the Board—there had been a complete reorganization of the works, and addition to their capacity. All this work was introductory to the second stage in the scheme which, among other work, has added to the manufacturing plant one of the most interesting retort-houses to be found in the suburbs of London or, as a matter of fact, it may be asserted, in the South of England. Professor Vivian B. Lewes spoke truly recently, when he said (*ante* p. 235) these works are one of "the most advanced in England, and, when the alterations now in hand are completed, they will be one of the show works of the country." He added that he knew of no works where the process of gas manufacture was more scientifically or better carried out.

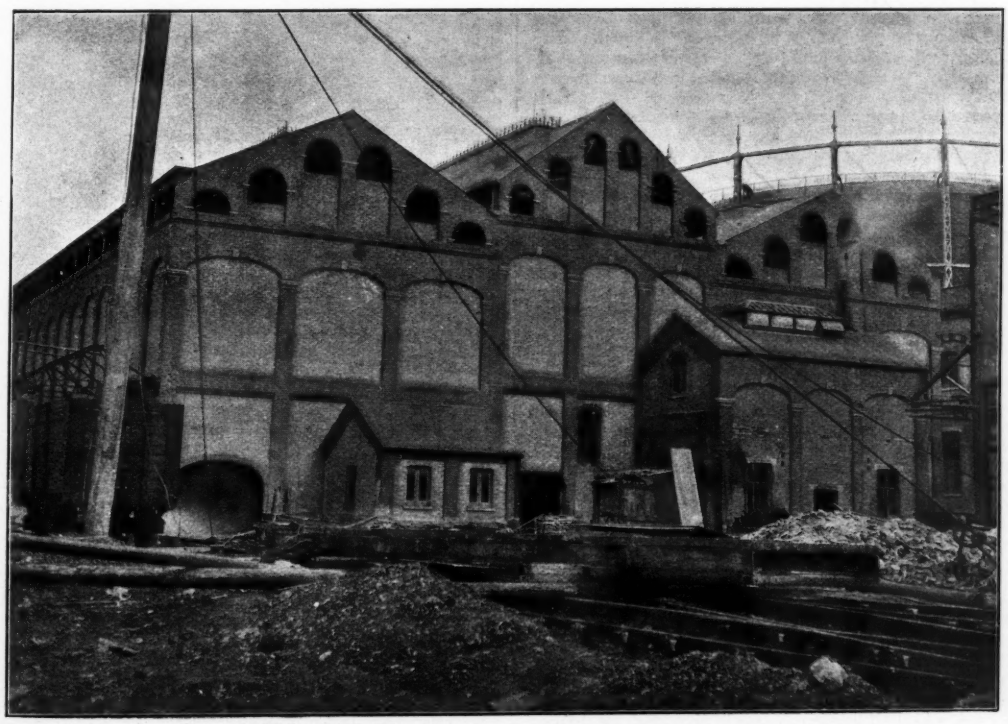


The Road Leading to the New Retort-House.

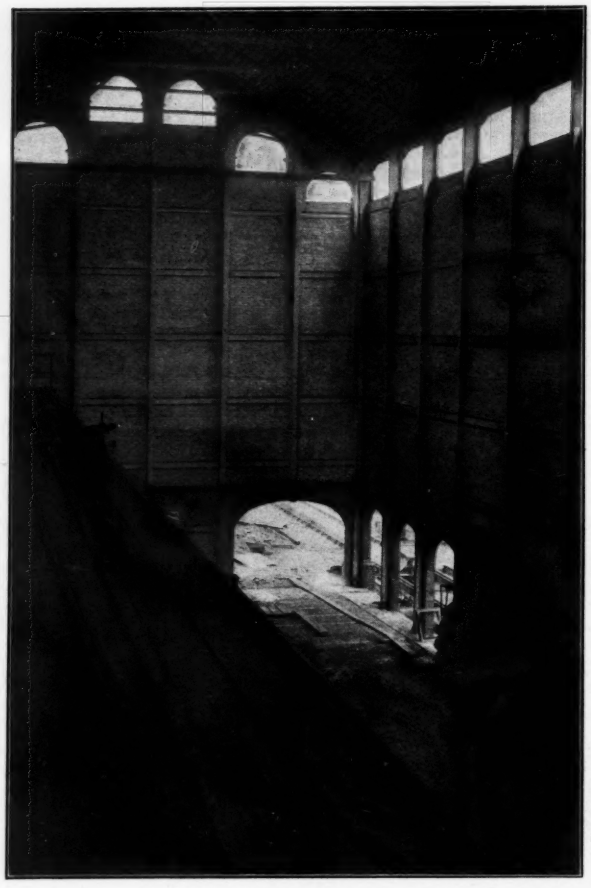
THE NEW RETORT-HOUSE—A ROLLED STEEL JOIST STRUCTURE.

The new retort-house is the subject of the present article; and the truth of what we have said as to the interest attaching to it will be conceded by readers when they have perused the outline of the construction and equipment which a recent visit and the courtesy of Mr. Broadberry enable us to give.

The building is about 152 feet long by 121 feet wide, and is built in three spans—the roof of the centre one being elevated somewhat above the two outer ones. The centre span is 35 feet wide, and the outer ones each about 43 feet. The height of the building to the eaves is 41 feet. So far as the structure itself goes, its chief interest lies in the fact that it is built of rolled steel joists, with panelling of only 4½-inch brickwork. If readers will turn to the "JOURNAL" for June 6 last, there will be found reproductions of photographs of the steel framing, which was constructed by Messrs. C. & W. Walker, Limited, to the designs of Mr. Broadberry. The steel uprights of the side walls are 12 in. by 6 in. rolled steel joists, 9 ft. 6 in. centres; and these are tied together by 6 in. by 6 in. T's about 6 feet apart. The web of the T is placed horizontally and built into the brickwork; and as by the design of the brickwork the upright joists are covered by the piers, none of the steelwork shows on the outside of the building. The plinth is of blue Staffordshire brick, the piers and string courses of red stock bricks, and the panels of yellow stock bricks. The joints are tuck-pointed—the whole being in architectural



North Gable of the Retort-House.



Inside the East Wall, showing the Steel Frame Structure.

harmony with all the other new buildings on the works. The character of the brickwork and the general aspect of the building are clean and attractive, and we have no doubt are, or if they are not they might well be, the subjects of some little pride on the part of the designer and of the builder (Mr. Monk). The roof principals are carried on the 12 in. by 6 in. uprights at the sides, and on 18 in. by 7 in. rolled steel joists, which, in addition to supporting the centre span, form the front buckstays of the retort-benches. The roofs of the three spans of the building are covered by slates; and in the apex of each are wide ventilation spaces, along the sides of which are crests of ornamental ironwork. The building is a complete contradiction of the assertion that pleasing appearance and economical erection are incompatible characteristics of gas-works structures.

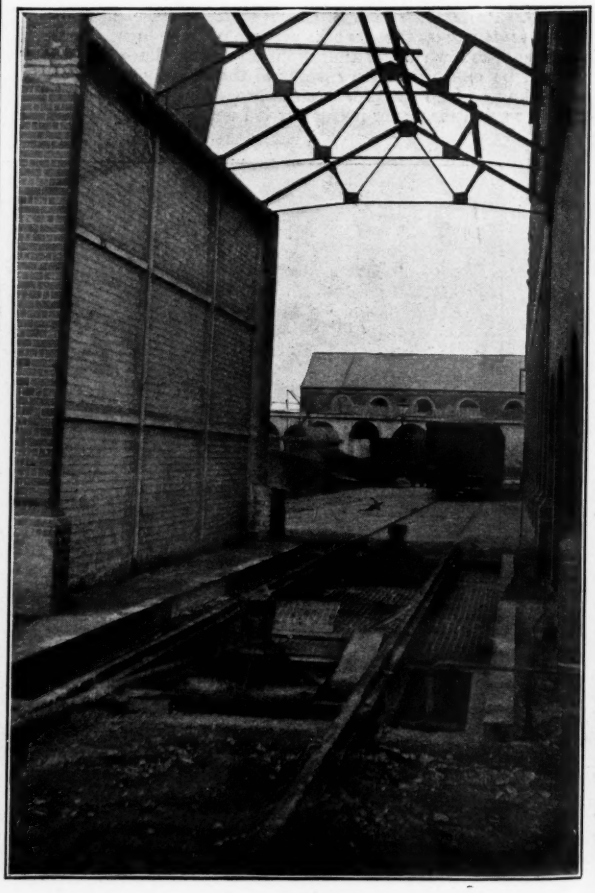
Up to the present, only one-half of the house has been equipped; and this is mentioned here in order to incidentally refer to the construction of the stage-floors. They are 10 ft. 6 in. above the basement; being built of steel-work, with concrete arches, and covered by 3-inch "Non-slip" manufactured York stone. The width of the stage at the back of the bench, where only the work connected with the discharge and removal of the coke will proceed, is 22 ft. 9 in.; while the stage in front of the bench is 35 feet wide. Now, and when the corresponding bench is built on the other side of the house, the spaciousness of the stage-floors will render the conditions of working as perfect as could possibly be attained in any house where carbonizing operations are carried on.

The Coal-Handling Plant.

In describing the equipment of the house, we cannot do better than deal with the plant in the order of its operation. In the first place, then, the coal required for the house will be brought, by way of the works' sidings and over a weighbridge, in trucks (handled by hydraulic capstans) to a large underground receiving hopper (of about 15 tons capacity) placed near to the north end of the retort-house. The trucks will be automatically emptied by being uplifted by a hydraulic ram situated below-ground, engaging with rear axle, thus shooting the contents of the truck through an end door on to a large screen covering the hopper. The screen is of $1\frac{3}{4}$-inch mesh. Seeing that at least 90 per cent. of the coal that is received nowadays will pass through a screen of this mesh, Mr. Broadberry does not consider a coal-breaker a necessity, and prefers that the remaining 10 per cent. of coal should be broken by hand. This system also affords greater security against iron bars or other foreign substances often found in the coal getting forward to injure the machines. At the opposite end of the screen, a second hydraulic ram is provided, for dealing with trucks which come in reversed. Passing from the receiving-hopper, the coal is fed by revolving fillers into one of two 24-inch gravity bucket conveyors, each of which will deal with 40 tons of coal an hour; the object being to get all the coal elevated and stored during the daytime, so as to have no unloading of coal during the night. The revolving fillers, by the by, are driven off the chain, so that there is a perfect synchronism between the outlets of the fillers and the buckets of the conveyors. The whole of this and the coke-handling plant is driven by a 50-horse power Marshall steam-engine, which, in duplicate, is situated in a room at the north end of the house, the upper floor of which will be used as a mess room for the men, and will be entered from the stage-floor. The gravity bucket conveyors incline to underneath the stage-floor, and then rise vertically for depositing the coal either into the overhead hopper conveyors or into a service hopper, the purpose of which is presently described. The conveyors are fitted with the necessary tipping apparatus for emptying the buckets at the required place.

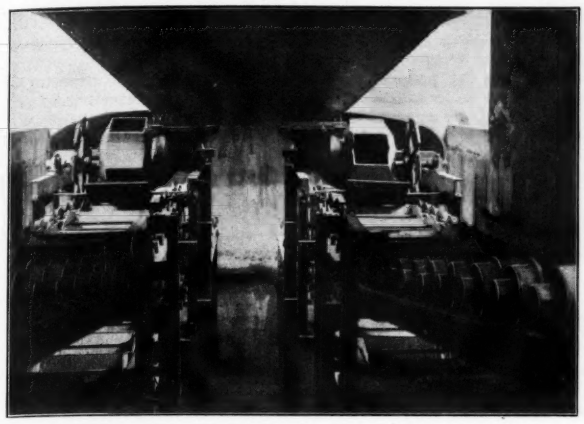
Dealing first with the long conveyor over the continuous hopper. This is of the push-plate type, 24 inches wide, running on cast-iron rollers; and to this coal from the gravity bucket conveyors is passed through delivery-shoots. The gearing in connection with this plant is of the usual type, and does not call for description. Underneath the continuous hopper (which has a capacity of about 240 tons) are measuring-chambers (one opposite each vertical line of retorts) similar to those used on the inclined retort system; and these measuring-chambers are fitted with the latest hydraulic apparatus for opening separately the slides—the valves controlling the hydraulic rams being actuated by a lever carried on the De Brouwer projector as it passes along. This principle of operating the valves of measuring-chambers has commended itself before to gas engineers; and it will be remembered that Mr. Herring in his Granton inclined retort-house adopted a somewhat similar method of working. It is clear, too, that Mr. Broadberry fully appreciates this system where large quantities of coal are handled, as it certainly reduces labour to a minimum, and does away with the long obstructing rows of levers sometimes seen in retort-houses.

In connection with the coal-handling plant, there is another interesting feature; and it has reference to the at present unoccupied portion of the house. Mr. Broadberry is not going to allow it to remain unused, but is putting it to the serviceable purpose of supplementing the coal storage. From the two gravity bucket conveyors already mentioned, arrangements have also been made for feeding coal into a temporary overhead service hopper of some 15 tons capacity; and from this hopper small tip waggons will be fed, which will run upon a light narrow-gauge railway, supported on a gantry. In this way, the tip waggons will be able to discharge the coal into stock until it rises to a certain height; and then, if necessary, temporary lines can be laid on



Coal-Unloading Shed—showing the Screen Covering the Coal-Hopper.

the coal-stack for further increasing the stock. By these means the (until further carbonizing plant is required) vacant part of the house will be profitably utilized for coal storage.



Coal-Receiving Hopper and Automatic Feeders to Gravity-Bucket Conveyors.

It will be seen from this general statement that the coal-handling plant is of a most complete and interesting character; and into it, the contractors, Messrs. Graham, Morton, and Co., of Leeds, working to the plans and specifications of the Engineer, have put some excellent work.

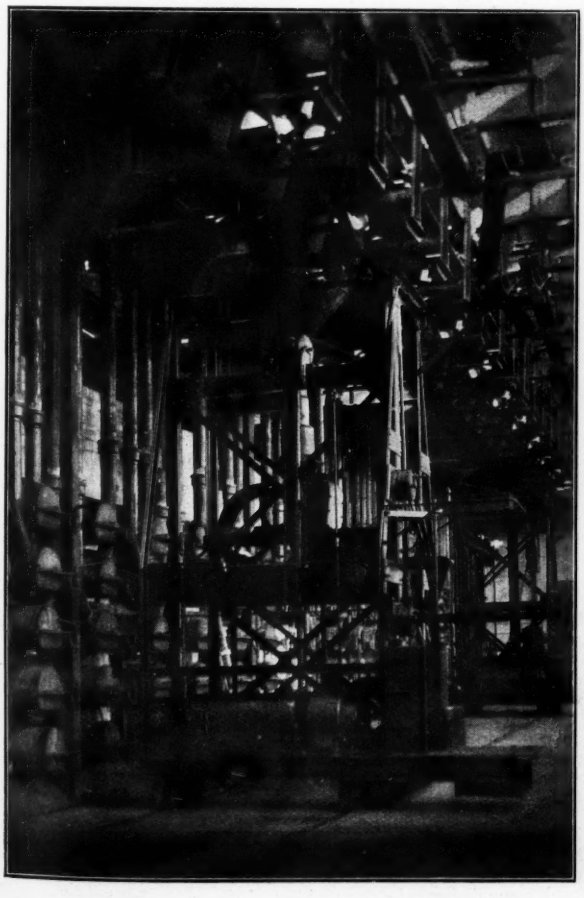
The Retort-Settings and the "De Brouwer" Projector and "Jenkins De Brouwer" Discharging Ram.

There is little to be said about the retort-bench itself. It consists of twelve settings of ten retorts set in two vertical lines. The retorts are 21 in. by 15 in. by 20 ft. long; and the producing capacity will be about $1\frac{1}{2}$ to $1\frac{3}{4}$ million cubic feet per twenty-four hours. The ascension-pipes are 6 inches in diameter; and it is noticed that the Bournemouth type of arch-pipe has been adopted. Regarding the hydraulic mains, the tar-tower system has again been applied for taking off the tar and for maintaining the liquor seal. Suffice it to say, as to the general character of the settings, that they are the work of West's Gas Improvement Company.

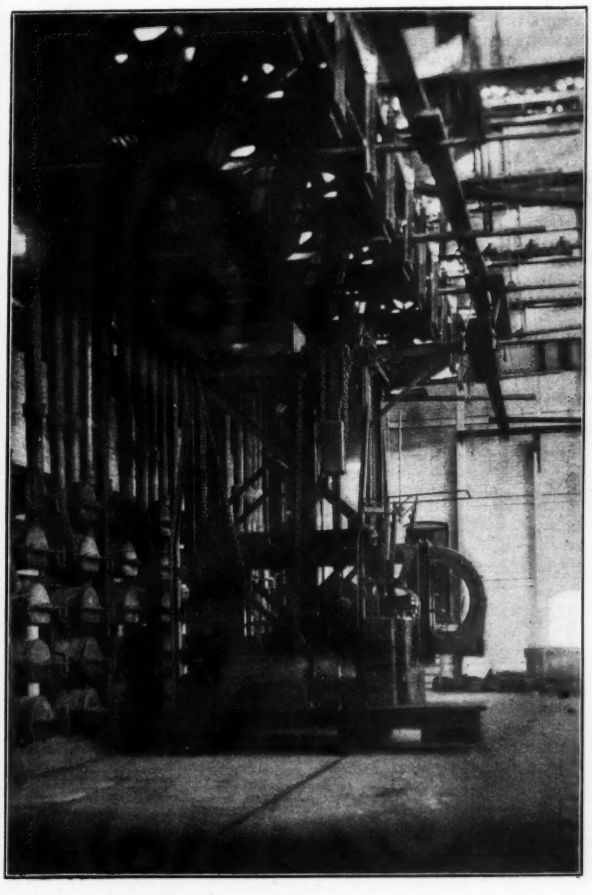
For charging and discharging the retorts, the "De Brouwer" projector and the "Jenkins De Brouwer" discharging machine have been adopted; and the two machines will do all the work of charging and discharging the 120 retorts in this bench. It will be a good opportunity for a fair test of their working capability—most of the houses hitherto described in which the machines have been installed having been of smaller producing capacity. To anyone who has been in touch with the development of these machines from the first projector that was developed and worked in the small retort-house at Bruges under the skill and care of the originator (M. de Brouwer), the features of these latest built machines will be at once apparent. The projector, in this case, is suspended in a steel frame-work, fitted with travelling wheels, and running on rails fixed on the stage-floor girders. On one side of the machine, a set of gearing with clutches is arranged, together with an electric motor, for raising or lowering the projector to suit the various tiers of retorts, or propelling it along the stage-floor. Over the projector, a tundish is fixed for receiving the coal from the overhead storage hoppers, whence it is directed by a telescopic shoot on to the band of the projector. As has already been explained, the hoppers have openings fitted with slide doors, one opposite each vertical tier of retorts; the slide-doors being operated by hydraulic rams, controlled by a valve actuated by a lever arranged on the machine—the operation of which Mr. Broadberry kindly explained.

Respecting the "Jenkins De Brouwer" discharging machine, readers are aware that this is in the form of a self-contained telescopic ram, which, when extended, will push the whole of the coke out of a 20 feet through retort from one side of the bench. The ram is carried in a hanging frame, suspended by chains in a steel framework similar to that of the charging-machine, and fitted with similar gear for hoisting the ram to suit the various tiers of retorts and propelling the machine along the house.

It is also observed that both machines are controlled by a set of levers and controllers of the tramway type, arranged so that when charging or discharging the first, second, and third tier of retorts, they can be conveniently operated by the attendant standing on the platform at the base of the machines; and for charging or discharging the fourth and fifth tiers of retorts, a duplicate set of levers is arranged above with a hinged platform. Each machine is also fitted with two trolley poles of the tramway type, making contact with two overhead bare copper conductors, which run the full length of the house, and are supported at intervals on suitable insulators. At one end of the house, these wires are connected by means of insulated cables, which carry



The De Brouwer Projector—A Good View of the Overhead Coal Plant.



The Jenkins De Brouwer Discharger.

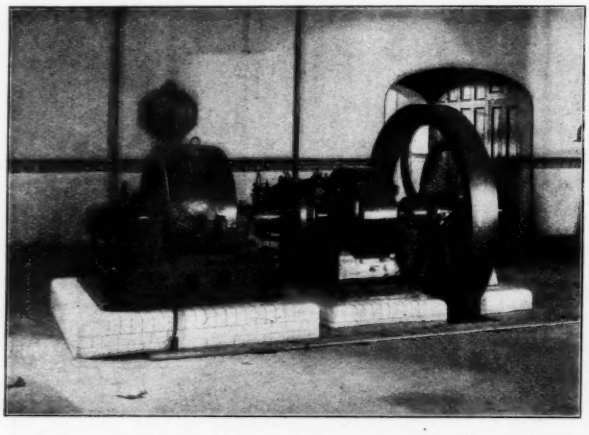
the current to and from the dynamo and main switchboard, to be alluded to presently, as they are situated in a separate building. But it may here be mentioned that the electrical plant was included in the contracts entered into with Messrs. W. J. Jenkins and Co., Limited, of Retford, whose work there is little doubt will as usual render a good account of itself.

Colman's Tar-Separators.

Passing from the front stage to the back of the bench, attention is arrested by one of Dr. Colman's cyclone tar-separators, which

Stage Running on Overhead Rails for Closing the Lids on the Discharge Side of the Bench.

is connected up with the 24-inch foul main. It is about 9 feet diameter, and is capable of dealing with 4 million cubic feet of gas per diem. The cyclone has been illustrated and described at various times in the "Journal"—notably, in the paper read by Dr. Colman at the meeting of the Institution of Gas Engineers in 1904. [See "Journal" for June 14, 1904.] The object of the apparatus is to remove the heavy tar fog from the hot gas as it



The Electrical Generating Plant—Dynamo Driven by Gas-Engine.

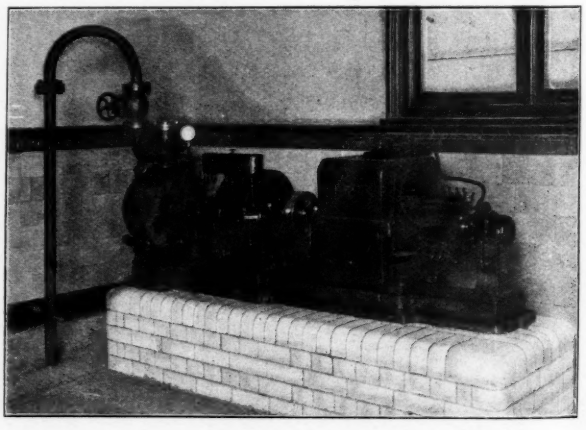
leaves the foul main before reaching the condensers, for the purpose of assisting in the more complete removal of naphthalene from the gas in the subsequent condensation.

The Coke-Handling Plant.

The plans for dealing with the coke (which are in course of embodiment at the present time) are found to possess several points of interest. There is one feature, however, that should preface the others; and it is found on the discharging side of the bench. With ten retorts in a setting, in two vertical tiers, the lids of the top ones cannot be conveniently dealt with from the stage-floor; and therefore a flying stage has been provided for the man opening and closing the top lids. This stage runs on an overhead track, and is worked electrically. It formed part of Messrs. W. J. Jenkins and Co.'s installation; but the whole of the coke plant, as was the coal-handling plant, was, or is being, supplied by Messrs. Graham, Morton, and Co. The trough for a hot-coke conveyor is in position; but again with these high retorts it is essential to have a coke-receiver to direct the course of the falling spent charges. This receiver is something new. It runs along the off-side of the bench, and is built up of two receiving-hoppers, through which the coke is directed on to the conveyor. But, separating the two receivers is a portion so constructed that it will, by means of swing doors, divert a falling spent charge direct into the producer. This has the appearance of being a very serviceable arrangement; and it will be interesting to see how it fulfils its purpose in actual operation. The coke-conveyor will take the coke straight away to sorting screens fixed above a large coke-hopper in the yard, which hopper is capable of holding 250 tons. The screening plant, we believe, is a special design that Mr. Broadberry has adopted with a view of reducing the breeze to a minimum. The various sizes of coke are stored in separate compartments, ready for loading through shoots, either into railway waggons or carts, or for delivery into sacks. There is a bagging arrangement at the bottom of each compartment, which is to be fitted with weighing apparatus for registering and weighing the amount of the bagged coke. A roof will be provided for protecting the men working at this outside hopper.

There is here further interest in the development of the system of dealing with coke. For stacking the unscreened or surplus coke, an overhead telpher system, electrically worked, is being provided. In this, an overhead track is run to the stacking places; and along this track an electrically propelled carriage, provided with raising and lowering gear, carries the buckets fed with coke from landing platforms at the overhead storage hoppers, round on the track to the desired position, where they are emptied, and returned to the feeding point. We have heard these electric telpher systems well spoken of, and believe that their simplicity and efficiency are giving much satisfaction wherever adopted. It is certainly a system to which engineers should give careful attention, for, by its means, coke can be rapidly stacked in any part of the yard with a minimum of breakage, owing to the fact that, when once coke is deposited in the buckets, in (say) 10 or 15 cwt. lots, it has only to drop on to the coke heap; and this must be a great advantage, as the drop is reduced to a minimum on account of the buckets being lowered to required level.

There is yet another mechanical means of conveyance; and that is for the coke to be utilized in the carburetted water-gas house abutting on the end of the new retort-house. Through shoots from the screened coke hoppers, coke is to be delivered to a gravity bucket conveyor running in a tunnel underground as far as the end of the retort-house. From there the conveyor is carried underneath the charging-stage, and rises vertically at the farther end, delivering into an elevated hopper, with a capacity of 100 tons. From this hopper, the screened coke is delivered by shoots through the partition wall between the retort-house and the carburetted water-gas house to the generating-floor of the latter. The different conveyors which have been mentioned can



Dynamo Driven by Steam-Turbine.

all be worked separately, and be electrically stopped at several points, so as to prevent trouble.

The yard coke plant, it should be mentioned, has been constructed of a size suitable for the next retort-house, the site of which (in proximity to the new house) has already been determined.

A further feature is that a trial is to be given to a system of coke desulphurization. Except, however, for metallurgical purposes, Mr. Broadberry does not at present see that any great advantage is going to be derived from submitting coke to this treatment.

It must be said that the whole of these arrangements for dealing with coke constitute about as perfect a means of mechanical handling as could be devised under circumstances, the gradual development of which to completion testify to foresight dating back some distance in the making of the plans for reorganizing and extending the works.

One other note was made before finally leaving the new retort-house; and it is that high-pressure gas-lighting is to be the means of illuminating the stage-floors of the house for the night work.

THE POWER HOUSE AND ELECTRICITY GENERATING PLANT.

Passing over the roadway to the new building which constitutes on the one side the fine exhauster-house (in which the exhausters have been assembled) and on the other the power house, the electricity generating plant is seen in the latter. The features of the plant are pointed out. This is part of Messrs. Jenkins' contract. The dynamo (by Messrs. Bruce Peebles and Co.) is of the continuous current compound wound type of 20 kilowatts capacity at 220 volts, which is coupled direct to a National high-speed gas-engine of 33-horse power, by means of a flexible coupling. The switchboard (which is of polished white marble) is fitted with volt meter, ammeter, and all the necessary switches and fuses, including, it is noticed, a double throw-over switch, so that a duplicate dynamo can be connected up. There is, in fact, already in position a De Laval steam dynamo coupled direct to a Greenwood and Batley specially designed dynamo, so as to supplement the above-described plant. This was supplied by Messrs. Humphreys and Glasgow.

In the power-house is also an excellent specimen of Sir William Arrol's type of pumps, and a second one (which is situated at present in another part of the works) has already its seating provided alongside. It will be shifted to its new quarters as soon as convenient. When opportunity allows, the power house will be tiled and finished inside like the exhauster house, and they will, apart from their engineering attractions, give further example of the truth that there is no necessity for gas-works buildings being of uninviting character. Environment must have its influence on the *morale* of workmen.

In concluding, our thanks are due to Mr. Broadberry and his chief assistant (Mr. John Terrace) for the interest they imparted to the visit, and which interest—supplemented by photographs kindly supplied—we have incorporated in this descriptive article.

AN ENGINEERING AND MACHINERY EXHIBITION.

IT is twenty years or more since a general exhibition of engineering and mechanical appliances was held—the whole of the exhibitions in the long succeeding period having been of a specialized character. There are advantages to the engineer in both classes of exhibition. Of the advantages which accrue from those of a specialized class, nothing need be said in the "JOURNAL." But regarding those of a general character, it was recently remarked in these columns that industrial exclusiveness may be very detrimental, through the ignorance it engenders of what is being done in kindred industries; and this has, to the full, application to engineering and mechanical appliances. The greater adoption of mechanical means for performing the operations of gas-works has brought into them plant similar in character to certain parts of the moving plant in electricity stations, at collieries, &c.; so that their purposes are identical. There is thus a fair amount of overlapping of professional interest in the industries—more than ever before; and therefore a general exhibition of engineering and mechanical appliances should now have a larger attraction than it had twenty years or more ago for engineers whose daily work runs in special grooves.

Such an exhibition is announced to take place from Sept. 15 to Oct. 17 next at Olympia; and from the preliminary information to hand, it is seen that it is being organized under "proper auspices, a capable executive, and a vigorous management." The basis of the exhibition is broad; and the list of patrons and the constitution of the Honorary Advisory Committee shows that the patronage and advice will be upon the same lines. Some most distinguished names in Science and the Arts grace the list. The President is Sir William H. White, K.C.B., LL.D., F.R.S. Among the numerous patrons are the Presidents of the leading technical organizations—the Institution of Gas Engineers being represented by the President (Mr. Charles Wood), and the Junior Institution of Engineers by Mr. Dugald Clerk. Professor W. C. Unwin's name also appears. Among the names of the 42 gentlemen constituting the Honorary Advisory Committee are enrolled those of Mr. James W. Helps, Mr. D. Irving, Mr. James Keith, Mr. S. J. Norton (Messrs. Crossley Bros., Limited), Mr. Walter T. Dunn, and Mr. Adam Hunter, the Chairman of the Junior Institution of Engineers.

The sections into which it is proposed the exhibition shall be divided number thirty; among them being the following:—

- Metallurgical Processes, Fuels and Raw Materials.
- Casting, Forging, Pressing, Rolling, Stamping.
- Workshop Tools and Appliances.
- Gas, Steam, and Oil Engines (Prime Movers).
- Transmission (Power).
- Lifting Appliances and Construction plant.
- Hydraulic Work.
- Pneumatic Work.
- Railway and Tramway Work.
- Bridge, Roof, and Girder Work.
- Weighing and Measuring Machinery.
- Chemical Plant.
- Machinery for Treatment of Raw Produce.
- Engineers' Stores, Paints, &c.
- Water-Works Engineering.
- Automatic Machinery.
- Machine Stoking and Labour-Saving Appliances.

THE ILFORD GAS COMPANY'S LITIGATION.

THE cases reported in the "JOURNAL" for the 30th ult., in which the Ocean Accident and Guarantee Corporation, Limited, the East Ham Corporation, and the Ilford Gas Company were concerned (some further proceedings in which are reported in another column) are chiefly interesting, from an engineering point of view, by reason of the fact that so much turned upon the question as to whether the flood, in June, 1903, was or was not of an exceptional and unprecedented character. The evidence of the plaintiffs in reference to the flood, as given by their engineering witness, Sir A. Binnie, was to the effect that it was not an unprecedented rainfall, but that the quantity of water was 6580 cubic feet per second, which with a velocity of 20 feet per second would pass through the Romford Bridge and be discharged by the River Roding into the Thames.

It was not disputed by the defendants that a quantity approximating to 6580 cubic feet per second was the flow of water consequent upon the abnormal rainfall over the whole of the valley in the several preceding days; but the defendants, by their engineering witnesses (Messrs. A. C. Hurtzig, George Chatterton, and E. K. Burstal), contended that the bridge referred to could not really pass this quantity of water with the admitted head of 1·9 feet, and that the main channel of the Roding below the bridge was incapable of dealing with it. As a matter of fact, it was proved in evidence that the channel of the Roding was already full, and that large quantities of water were passing through the Gas Company's premises—being unable to find a passage under the main bridge. Careful calculations show that the capacity of the channel of the Roding below the Company's premises is, when running full, 2920 cubic feet per second, and the capacity of the bridge 3110 cubic feet per second, or almost identical figures. Therefore, with the quantity of 6580 cubic feet per second which the plaintiffs stated had to be dealt with, there could be no other outlet for the water than through the Company's premises and over the embankment, and so on to the marshes.

In order that the vastness of this flood may be appreciated, it may be mentioned that in 1852, as referred to by Beardmore (p. 147), in an adjacent valley a flood was recorded of an intensity "without precedent in memory or record," and the discharge was 22·3 cubic feet per second per square mile of drainage area; whereas in the flood of June, 1903, the discharge, on the plaintiffs' figures, was 50·5 cubic feet per second per square mile. It is therefore not difficult to follow the well-reasoned judgment of the Official Referee, Mr. Muir Mackenzie, when he stated in commenting on the plaintiffs' case: "I cannot approve of such a method of shaping a claim. A great part of the claim made was unreasonable. . . . I entertain a very strong opinion that the particulars that were delivered by the plaintiffs in this case were such as call for severe criticism. They ought not to have been delivered, and the defendants ought not to have been put to the cost of dealing with them as they had to do; and, in my opinion, I have power to direct the Taxing Master to make a disallowance in respect of the costs of the particulars, and in respect of the costs of the evidence which was intended to support those particulars."

Manchester District Institution of Gas Engineers.—We are informed by the Hon. Secretary (Mr. H. Kendrick) that the annual meeting of the Institution will be held at the Midland Hotel, Manchester, on Saturday, the 24th inst. The *agenda* will consist of the report and balance-sheet for 1905, the report of the Commercial Sections, the President's (Mr. J. H. Brearley's) Inaugural Address, a supplementary paper on "Purifier Grids," by Mr. Kendrick (which will be discussed, together with the one taken as read at the Stockport meeting last November), a discussion on Question-Box answers, and other business.

The Late M. Lecomte.—In the last number of the "JOURNAL," we recorded with regret the death, at the early age of 37, of M. Auguste Lecomte, of Paris. We are sorry to have to supplement the particulars then given by the announcement that the sad occurrence was the result of an accident which happened during the course of some investigations. We learn from the "Journal de l'Eclairage au Gaz et à l'Electricité" that M. Lecomte was conducting an experiment in the laboratory of M. Luchaire, with whom, as mentioned last week, he had been associated in the production of the petroleum standard of light shown at the meeting of the Société Technique at Havre in June. He had fitted up an apparatus for carburetting oxygen; and the experiment was going on to his entire satisfaction, when he discovered that a mantle was required for the burner under test. One of his assistants left the room to procure the mantle, and a few seconds afterwards a violent explosion occurred, the effect of which was to cover M. Lecomte with a shower of burning hydrocarbon. He was very badly burnt about the hands and face, and was immediately conveyed to a hospital; but his injuries were not so serious as to cause fear that they would prove fatal. Probably, however, the shock to the system aggravated a cardiac affection from which he suffered; and he succumbed the next morning. Reference was made last week to M. Lecomte's characteristic energy in inquiring after scientific truth and investigating every detail. It may truly be said of him that he fell a victim to his thoroughness and love of work.

SOME MUNICIPAL QUESTIONS AND THE RISE OF THE LABOUR PARTY.

By V. R. BALFOUR-BROWNE, Esq., Barrister-at-Law.

SOME observations contained in an article entitled "The Ambition of the Liverpool Corporation," in the "JOURNAL" for Jan. 30, as to municipal trading, have suggested to me the importance of considering this large question at the present time. The politicians may be right or wrong in saying that Socialism is to come through the Municipal Council Chambers; but indications of their prescience in that direction are not wanting. I know that in the recent General Election the chief feature which has struck all impartial observers has not been the staggering defeat of the Unionists, not the overwhelming majority of the Liberal Party, but the strong representation in the new Parliament of the Labour Party. That this is a significant feature of the election, none can doubt. Capital is going to be municipalized out of existence. This would be a small thing, if the capital in municipal hands was used for the benefit of the community as a whole; but it is a very important one if the collective ownership of capital is to turn out to the serious detriment of the community.

Where capital in collective or municipal hands fails, is in enterprise. A municipality has never exploited any enterprise to success. Private enterprise is always the jackal which provides for the municipal lion. When the corporations see that an enterprise for the supply of gas or water is successful—when they see that it has been made prosperous by private enterprise—they have itching fingers to lay hold of it; and statesmen and Parliament have furthered their greed. To such an extent has this gone, that there is not now one single water undertaking in Scotland in private hands. We know that recently the Water Companies of London have been expropriated under Act of Parliament; and in England there are but few great water companies existing at the present day. But the same vice has crept into Colonial policy. A year ago the Water Companies at Johannesburg were expropriated under ordinance by the Municipality. This shows how fast the municipalization of the means of production and distribution is becoming, not only practical politics, but accomplished fact. I am not speaking as a party politician, for many of these measures were introduced and passed by Unionist Governments. They were playing with fire; and the recent election was for them a conflagration.

I spoke of the means of distribution; and this leads me to make a few remarks upon the question of tramways in the hands of municipalities. In a case before one of the Chancery Courts last month, counsel for the Corporation of Manchester stated that the Corporation had handed over, in the last two years, £100,000 out of the tramway profits to the relief of the rates of the city. This fact shows whereon the hopes of the Socialists are founded. If the rates of a town like Manchester can be relieved to this large extent by a tramway undertaking in the hands of the Municipality, one has only, they think, to extend municipal ownership and management in other directions—to accomplish the extinction of all rates. It is merely necessary to oust capital to come to a Municipal Eldorado.

The case to which I have referred is interesting in this connection. The Manchester Corporation were the owners of a large system of tramways; and, under various Acts, they had, in conjunction with neighbouring municipal authorities, become the lessees and "operators" of a large extension of these tramways beyond the city. They had, too, been authorized to carry passengers, minerals, goods, and parcels, on their tramways. They had, purporting to act under these powers, established a great system of parcel carriage in Manchester, and claimed the right to collect and deliver parcels, which were to be conveyed on the tramways owned or leased by them. But not content with this, they claimed the power to carry parcels from a consignor to a consignee by van—parcels which never used the tramways at all. They also asserted that they had the right to collect parcels and convey them to various railway stations, from which they were carried by rail to every spot in the United Kingdom, and even to places beyond. The result of the establishment of such a system in the hands of the Corporation would be to run all independent carriers off the road; and certain people who carried on the trade of common carriers induced the Attorney-General to intervene. The question submitted to Mr. Justice Farwell for decision was whether the Corporation—either under their tramway powers or under their powers as a Municipal Corporation—could do this thing.

The London County Council had, in a case which went to the House of Lords, failed to establish their right to run omnibuses, as feeders to their tramways, over Westminster and other bridges. But here was a new departure under a different set of circumstances. I know, of course, that only during the last session of Parliament the London County Council obtained the power to run steamboats on the River Thames. I know, too, that these steamboats never can be made to pay; but there you have the spoliation of Socialism in an active form. Whether they pay or not, they will be run for the benefit of the poor, out of the pockets of the ratepayers of London. But this claim of Manchester goes even further. They claimed, apparently, as incidental to conveyance, to insure the articles so collected, conveyed, and distributed; to receive the price of articles from the consignees and transmit it to the shopkeepers who had sold the goods contained in the parcels; and as they acted as agents for all the railway companies, they collected for these the entire charge for conveyance on the railway to the place of ultimate destination.

This was evidently a great municipal enterprise, and would undoubtedly have resulted in the concentration of the whole parcel carrying trade of Manchester and the district round in the hands of the Corporation. Of course, the learned Judge, in his judgment delivered last week, pointed out that it was no part of his function "to consider whether municipal trading of this kind is or is not politic;" but he was so far with the Corporation as to declare that they had the right to collect and deliver as well as convey parcels. The declaration which he made was "that the defendants are not entitled to expend any part of the city fund, or the receipts of their tramway undertaking, or the proceeds of any city rate, or any other moneys of the defendants, or the city, for the purpose of establishing, or maintaining, or carrying on the business of carriers, except as part of, and in connection with, their tramway undertaking, and in respect of articles carried along all or part of the tramways for the time being belonging or in lease to the Corporation, or on which they have power to place or run carriages." He granted an injunction in similar terms. That this is a great extension in the direction of municipal monopoly, none can doubt; that it has been allowed by statute, has been decided; whether it is politic or not, is for the public to decide. As we have seen, the tendency is to Collectivism in these days; and we must face the fact, and its various disadvantages.

It has been already remarked that the municipalization or the state-ownership of all means of production and distribution might be justified if the result was a benefit to the community. But I am of opinion that Collectivism fails here. Up to the present time, the municipalities have only desired to lay their hands on enterprises that pay. In my view neither the State nor the municipality can or will be enterprising. They have in many cases acquired gas undertakings; but even now gas is supplied at its cheapest, not by corporations, but by companies. Where, however, the State has to speculate and run risks of failure to attain success, it will be a failing instrument for the good of the people. They cannot, they dare not, take the risk of great losses. Private enterprise has shown that it is the pioneer in every direction. Electricity as a means of lighting was taken up by companies, not by corporations. It is only when success is really assured that the public bodies will attempt the enterprise.

A curious illustration of this occurred a year or two ago. Maryport Harbour was in the hands of a public body of Trustees. The trade of the port had dwindled and decayed. The size of vessels had increased. All the great ports were increasing the size of their docks, and the depth of their cills of the entrance locks, with a view to accommodate the larger class of ships now afloat. The Trustees of Maryport were faced with this difficulty. They had either to expend large sums in improving their undertaking, or go the wall. What happened was that they agreed to sell their undertaking to a company of "adventurers," as promoters were called in the old days; and an Act was passed authorizing the transfer, and also the expenditure of capital to make Maryport a really good port.

Other instances might be pointed to of the same failure of municipal bodies to seize and utilize occasions. They must, by reason of their constitution, be timid. They are composed of men who have but a short tenure of office—a tenure which a mistaken policy resulting in loss to the rates would put an end to. It is this fact that paralyzes municipal hands, except in relation to what may be called "gilt-edged" industries, where success is practically assured. But it is this also which makes capital in Collectivist hands ineffective for public benefit. Just as we have to look to an Edison or a Marconi for our great discoveries, so we must look for the great adventures of capital to private enterprise. It is because of the discouragement of this, and the increasing power of municipal monopolization, that I look with dissatisfaction on the present developments, especially when these are taken in connection with the rise of the Labour Party to power.

CORRELATION OF CHEMISTRY & ENGINEERING.

The Evolution of Mr. Dugald Clerk, the Gas-Engine Expert.

When professional elders meet professional juniors—as did Mr. Dugald Clerk (the President), Dr. T. E. Thorpe, the Principal of the Government Laboratories, Dr. E. J. Mills, Professor C. V. Boys of the Metropolitan Gas Referees, and Mr. G. Croydon Marks, M.P. (of Messrs. Marks and Clerk), at the anniversary dinner of the Junior Institution of Engineers at the Hotel Cecil on Saturday evening—it frequently follows that, in the speeches made, there is something really worth listening to, and recording. There were several toasts proposed on the occasion; but we are not going to follow them through, as the space at disposal must be occupied by some didactic communications on the subjects crystallized in the headings above.

It was in proposing the toast of "Chemical Science" that Mr. Dugald Clerk related how, some thirty years ago, he was "an ignorant young man." He may have been "ignorant;" but reference to a subsequent speech made by Dr. Thorpe shows that he was remarkably intelligent. At that time he was gaining

experience in the workshops and drawing office; but while at work in the shops during the day, he took to attending lectures at Anderson's College, Glasgow (now the West of Scotland Technical College)—taking chemistry under Professor Thorpe, and electricity under another celebrated man. He became so enamoured of chemistry that he thought at one time of becoming purely a chemist. In the beginning of 1872, Professor Thorpe offered him an assistantship, which was gladly accepted; and he set the new assistant to work on the fractionating of paraffin oils. The six months' work that he then did in distilling paraffin oils, and separating one oil from another, was to him one of the most illuminating experiences that could possibly be imagined. This gave him a fund of knowledge on the question of oils for oil-engines that in later years caused surprise to his engineering friends—so much so that Professor Perry made reference to it in his book on steam, gas, and oil engines. This little sketch is taken from the President's opening remarks; and in succeeding parts of his speech, he observed that chemistry was invaluable to the engineer, and he questioned whether the internal combustion engine would be in its present position as to scientific development but for the application of chemical principles. As far back as 1882, he had the honour of reading a paper before the Institution of Civil Engineers on "The Theory of the Gas-Engine," in which paper he was able for the first time to apply his chemical knowledge to the phenomenon of combustion. In his investigations, he had obtained some extremely interesting results, which he thought he might claim had had a distinct effect on the development of this type of engine. This was due entirely, he emphatically asserted, to his early training in chemistry. He mentioned these things because he wanted to impress upon the members of the Junior Institution of Engineers that, in many branches, chemistry and physics and engineering must go hand in hand. Starting from that date, experiments had been made by many English and Continental chemists, and now there was quite a rush of papers to the Royal Society and other technical institutions upon the subject of gaseous explosions. This illustrated at least one application of chemistry to engineering; and modern engineering had so developed that in some branches it was hardly possible to tell where engineering ended and chemistry began. He proceeded to challenge the tiring statement that we have to go to Germany and France for chemists and to America for engineering inventions; and he quoted the names of many of the distinguished men in both branches of science to which the British Isles had given birth; and to the Parsons steam-turbine he gave the honour of the most conspicuous place in modern invention. Regarding the opportunities for technical education, he spoke of his own experience of thirty years since, and of the subsequent great development of those opportunities.

Though it may have been a little embarrassing to Mr. Dugald Clerk, his old master, Professor Thorpe—knowing the value of living example—rightly took advantage of an opportunity which may never recur under similar circumstances of giving encouragement to the members from the knowledge of their President gained during association in the student and early working days of the latter. In his remarks, he said the President had dwelt upon some of the affinities which engineering science had to that which he (Professor Thorpe) and Dr. Mills represented. To-day these sciences were so correlated—they were so intimately associated one with the other—that it was a comparatively easy task to find examples of the mutual help, of the interdependence, which they had one upon the other. He must confess, however, that as regarded chemistry, it had always appeared to him that chemistry was much more indebted to the science of engineering than engineering was indebted to chemistry. For even in the examples that the President had laid before them, it was, as a matter of fact, much more to physics than to chemistry that the special services to which he had alluded were due. So far as he immediately gathered, the chemist was of service to the engineer only to the extent that he, from time to time, showed the engineer something of the chemical nature and composition of the materials with which he was concerned; on the other hand, large branches of applied chemistry were solely dependent upon the engineer. Indeed, it was only by the applications of mechanical science to chemical processes that the results of these chemical processes could be turned to material account. Their President had made an allusion that night which had awakened many a recollection. It was now upwards of a third of a century ago that he (Professor Thorpe) first made acquaintance with Mr. Dugald Clerk. Time had dealt gently with Mr. Clerk; and he could only hope it had dealt equally gently with himself. He recalled the spectacle of a young, earnest, enthusiastic youth sitting right opposite him in the middle of the bench (having secured that place by early attendance) in the class room. Even in those days of so far back as 1870-71, he (Professor Thorpe) was face to face once a week with hundreds of the youth of Glasgow, anxious to pick up the elements which he and his colleagues had the opportunity of offering to them. Chief among these youths was the friend of the Junior Institution of Engineers and his own friend—the President. He could not but fain be struck and much impressed with the enthusiastic manner in which young Dugald Clerk attended those lectures. There came eventually an opportunity of finding out, by direct personal contact, what manner of youth this was that he was instructing. At that time, the President of the Institution to which he (Professor Thorpe) belonged was Mr. James Young, whose name would be recollected in connection with the great paraffin industry of Scotland. James Young was himself an offshoot of that Glasgow Institution; and he invariably, in afterlife, put down his success to the opportunities he had enjoyed in that very place. And when he came to honour and riches, he was a generous benefactor to that Institution. Mr. Clerk had alluded to some of the work he had done in connection with paraffin oils. The work was a suggestion made by Mr. Young himself. They wanted to get to the real *rationale* of the cracking of paraffin oils. That was the problem he (Professor Thorpe) was engaged to investigate. The investigation required a very prolonged course of fractional distillation; and Mr. Young, with that liberality and forethought which was characteristic of him, said he would be perfectly willing to afford him the assistance required for this extended investigation if only he could find an assiduous youth. He at once thought of the assiduous youth who, week after week, he had been confronted with in the class room. He should never forget how one night he sent his assistant to ask the attendance of this young man, whose name he did not even then know; and he put it to him whether he would come into his (the speaker's) laboratory, and become his assistant in connection with this investigation. He should always remember—the memory was as clear to him that night as if it were but yesterday—with what feeling his young friend received the proposition.

Continuing, Dr. Thorpe said he should like to show how this episode coloured Mr. Clerk's subsequent career. When he (Professor Thorpe) was appointed first teacher in chemistry in the Institution which had developed into the University of Leeds, Dugald Clerk was persuaded to accompany him there; and he acted as assistant in the new capacity. It was one of his duties, in connection with the position, to assist in an investigation that cost him a considerable amount of mechanical energy. Dugald Clerk came to him on one occasion, and said: "If you have no objection to my driving a machine, by taking advantage of the energy which is contained in the Leeds water supply, to do the work which up to the present time my unfortunate arms have been doing, I shall be glad. I have found all the material I shall want for the machine in the workshops." He (Professor Thorpe) gave him *carte blanche;* and Dugald Clerk fitted together a machine which did the work satisfactorily. That episode was the turning-point in their friend's career. He conceived an idea for making small motors which should take advantage of the common sources of energy which are at the disposal of every householder. Through ill-health, however, Dugald Clerk had to leave him, to take rest. But the germ of the idea stuck; and eventually he worked out and developed the gas-engine which was associated with his name. From that gas-engine, he had risen to the position he now occupied. He (Professor Thorpe) could not claim that he made a great chemist of the President; but he could at least claim that he had done nothing to prevent him becoming a great engineer.

That is the story, as told on Saturday night at the dinner of the Junior Institution of Engineers, of the evolution of Mr. Dugald Clerk, gas-engine expert. Dr. Mills also spoke of his connection with Mr. Clerk for a short time, subsequent to the story related by Dr. Thorpe.

The Millennium Light.

At the meeting of the Rhineland and Westphalian Association of Gas, Electrical, and Water Engineers, held at Bad Godesberg last September, Herr Büsché, of Cologne, read a paper on the Millennium light. He mentioned that it could be employed in units affording from 50 to 2000 candle power, and that, as a result of practical trials, it was found capable of giving duties ranging from 27·6 candles per cubic foot in small units to 37 candles in large units. The municipal lighting of Berlin, where Millennium burners are employed, has been in successful operation for two years; the total gas consumption being 35,000 cubic feet per hour. The burners have been adopted in the new Central Trade School at Munich and at a large school at Freiburg—semi-diffused or indirect illumination being used. The same system is being installed in a similar institution now in process of erection at Augsburg. The apparatus requires no attention beyond the opening and closing of two cocks, and its lubrication with a good oil or grease. Periodical cleaning, is, of course, necessary where much dust is present; but the light is employed satisfactorily in the retort-houses of numerous gas-works. It is said that some 212 million cubic feet of gas are being consumed annually in Germany in Millennium burners.

German Coke for British Iron-Works.—A Darlington correspondent communicates to the "Daily Telegraph" the intelligence that he is informed that the Barrow Hematite Steel Company, Limited, have just completed a contract for early delivery of no fewer than 10,000 tons of German coke; the rate being 20s. 9d. per ton delivered at Barrow Steel-Works. It was also reported that the Millom and Askham Hematite Iron Company, Limited, are arranging to shortly take delivery of large quantities of German coke. Both the Barrow and Millom steel-works have previously almost exclusively depended on the Northumberland and Durham collieries for their fuel supplies.

THE LATE SIR WILLIAM T. MAKINS.

The Funeral and Memorial Services.

THE funeral of Sir William T. Makins, Bart., the Governor of the Gaslight and Coke Company, whose death on the 2nd inst. was recorded in the "JOURNAL" last week, took place on Tuesday. The first part of the service was begun at 12.15 p.m. in Henley Parish Church, and the body was interred in the churchyard of Greys Church, about three miles from the town; the residence of the deceased (Rotherfield Court) being in that parish. The service was conducted by the Rector of Henley (the Rev. J. F. Maul). The chief mourners were Lady Makins, Mr. Paul Makins (the eldest surviving son), and the other members of the family. Among those present were Sir Hugh Owen and Mr. John Miles, Directors of the Gaslight and Coke Company; Lord Claud Hamilton (Chairman), and Mr. J. Foster (a Director), representing the Great Eastern Railway Company; a number of County Justices; the Churchwarden and Sidesmen of Henley Church, of which Sir William was a Churchwarden up to the time of his death; and the Head Master, Master, and boys of the Royal Henley Grammar School. There were upwards of 90 wreaths; among the senders (apart from the family) being the Directors and staffs of the Companies mentioned.

Simultaneously with the funeral, a memorial service was held at Holy Trinity Church, Kensington Gore, conducted by the Rev. H. B. Coward, the Vicar; and another at St. Matthew's, Great Peter Street, Westminster, at which the Rev. H. E. Simpson officiated. The latter was attended by several of the Directors and a large number of the officers and employees of the Gaslight and Coke Company.

OBITUARY.

SAMUEL STEWART.

WE record with extreme regret the death on Tuesday last, at his residence, Broompark, Cove, Dumbartonshire, of Mr. Samuel Stewart, who for 35 years held the position of Gas Engineer and Manager to the Corporation of Greenock, from which he retired just six years ago. Deceased was born in 1833 in Glasgow; his ather being a civil engineer. The family, as not unfrequently happens, "came South," and young Stewart received the greater part of his education in London. He had his earliest preparation for the gas engineering profession from Mr. David Methven, who was the Superintendent of the King's Cross works of the Imperial Gas Company, which was amalgamated with the Gaslight and Coke Company in 1876. Eleven years before that event, however—viz., in 1865—Mr. Stewart went North again, and was at work for the Corporation who were so long and so faithfully served by him. He was appointed Manager of the works, which were then situated in Crawford Street (the Glebe), in succession to Mr. Ritchie. Under his superintendence, they were largely extended as the demands of the town increased. In 1872, it was found necessary to have a new site; and Mr. Stewart reported in favour of the ground at Inchgreen. This was duly approved by the Local Authority and by Parliament. The works were accordingly transferred to the new site, and Mr. Stewart was entrusted with the important duty of converting it into a first-class gas-manufacturing establishment, equipped with all the latest improvements. Under his supervision, the gas undertaking was the means of putting large surpluses into the Corporation exchequer. When, early in 1900, he felt that the time had come to retire, he sent in his resignation. It was proposed that he should continue his connection with the Corporation in the capacity of Consulting Engineer; but the idea was not carried into effect. Mr. John Chalmers, who had been for some time in the service of the Corporation, was appointed; but he only held the position a few months. He died on the 5th of July, 1900, and was succeeded by Mr. W. Ewing, of Hamilton.

Mr. Stewart had had good experience in the construction of gas-works before he went to Greenock—having erected some for Pernambuco in 1857, and others for Bahia a few years later. But his life-work was done on the banks of the Clyde. He was an old member of the North British Association of Gas Managers, and was chosen for the presidency in 1876. He opened his Inaugural Address on that occasion with an interesting account of the origin of the Association. He was President a second time in 1890, when the members met in Perth. He was the only Manager in Scotland who introduced the Klönne method of heating regenerative retorts, and in 1885 read a paper in which he described the furnaces he had erected at the Greenock Gas-Works. But the system does not appear to have been a complete success. He also introduced the first Peebles oil-gas process; and for some years it was worked by him with profit. The year following his retirement six years ago, he was elected an honorary member of the North British Association, in conjunction with the late Professor W. Ivison Macadam. Mr. Stewart joined the British Association of Gas Managers in 1881—the year before it became the Gas Institute, and served upon the Council from 1893 to 1896, when he was chosen as one of the Vice-Presidents, his colleague being Mr. Stelfox. He eventually succeeded to the presidency, and held it for the year 1898-9.

The funeral took place last Friday at the Greenock Cemetery, and was attended by a large number of his former professional brethren (among them being Mr. W. Ewing and Mr. M'Gilchrist), as well as by a fair representation of the public men of the town. Mr. Stewart was twice married, and is survived by a widow.

Our Scotch Correspondent sends the following appreciative remarks of the late Mr. Stewart: "The death of Mr. Samuel Stewart, late of Greenock, removes another of the veterans of the gas industry; and there are few remaining in harness who were his colleagues when he was in his heyday. Mr. Stewart was a most successful gas manager, and had it not been for the blight which fell upon the town of Greenock—first through the losses incurred in connection with the construction of the costly James Watt Dock, and afterwards by the failure of the sugar industry—I think it cannot be doubted that his life would have ended much more comfortably than it did. Those events happened after the Corporation had erected the large new gas-works at Inchgreen; and it has been evident that ever since the lean years developed, there has been a disposition on the part of the Corporation to avoid expenditure as much as possible. On that account Inchgreen has not been the success it would have been if it had been more generously kept up. Mr. Stewart struggled on for awhile against the current of events; but his health at last gave way, and he retired. His retirement came upon his brethren generally as a surprise; its announcement being made very soon after he had reached the very top of his profession. When he did retire, it is not to the credit of the Corporation that they delayed the fixing of a retiring allowance to him till about two years ago; and that, when they did at last dispose of the question, they voted an altogether inadequate sum, considering the services they had received. Of Mr. Stewart's personal qualities, it is unnecessary to write. No one ever knew him as anything but a most courteous and affable gentleman. Not a few of the present gas managers, in Scotland and elsewhere, passed through his hands. By them, he was held in the utmost veneration, which is one of the best proofs of his goodness of heart and greatness of mind. He should have left Greenock after he had erected the works at Inchgreen; but probably he did not realize the turn events would take; and, sanguine man as he was, he stuck to his post till it was too late. As a matter of fact, he was spoken of as Manager for Edinburgh at the time of the transfer; the promoters of the scheme having consulted him. But no vacancy occurred at the time, and he remained where he was. The ailment which laid him aside was an affection of the brain."

The death occurred early on Monday morning last week, of the Rev. E. H. PEROWNE, D.D., Master of Corpus Christi College, Cambridge. Deceased was born on Jan. 6, 1826, and had thus entered his 81st year. The interment took place at Grantchester on Wednesday, and among the floral tributes was one from the employees of the Cambridge University and Town Water-Works Company, of which Dr. Perowne was Chairman.

Mr. JAMES DICKIE, Town Clerk of Irvine, was recently found dead in his room in the Town Buildings. Mr. Dickie was an exceedingly busy man, and a man of all-round parts. Besides being Town Clerk, he was a leading member of the Law Societies, took a great interest in questions relating to municipal and county government, and held a large number of public offices. He was Clerk to the Irvine and District Water Board and Secretary and Treasurer of the Irvine Gas Company.

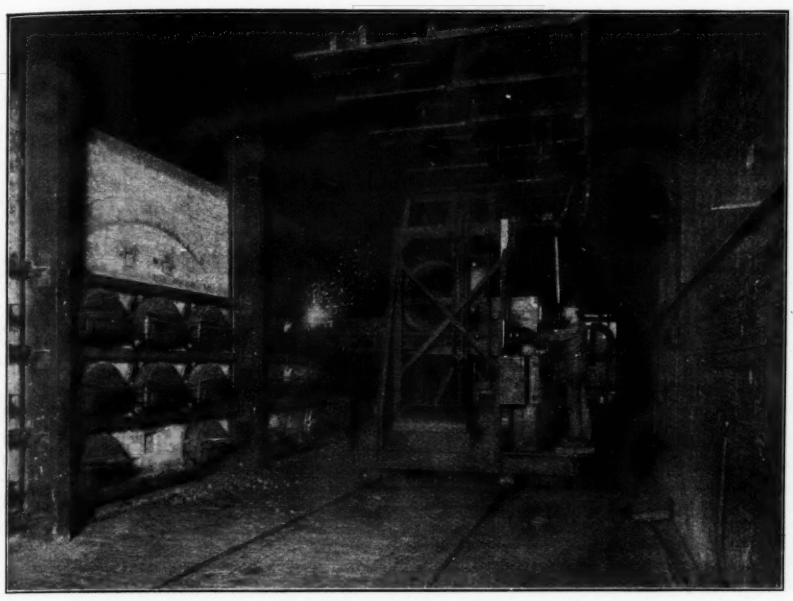
The death took place on the 3rd inst., in his 76th year, of Sir CHARLES ALFRED COOKSON, K.C.M.G., C.B. The sad event calls for notice in our columns owing to the fact that when Sir Charles retired from the public service in 1897, he devoted much of his leisure time to the work of the Smoke Abatement Society. For several years he did not use in his house, in Cheyne Walk, Chelsea, any bituminous coal, but only coke, which he ignited by pipes under the grate connected with the ordinary gas supply. Many persons called to inspect his method, which, it may be remembered, he explained at length in a paper read for him by Dr. Mortimer, at the conference of the Royal Sanitary Institute held in Westminster last December. He calculated that if his plan were universally adopted, London would save some millions of pounds annually in repairs, painting, cleaning, &c., to say nothing of the joy of breathing an unpolluted atmosphere. He was the elder and only surviving brother of Mr. Montague Crackanthorpe, K.C., better known to many of our readers as Mr. Montague Cookson.

Dr. Thomas Rutherford Adams, a Director of the Croydon Gas Company, whose death was announced in the "JOURNAL" a short time ago, left estate of the gross value of £22,390.

The Working of Suction-Gas Plant.—Mr. H. Moores recently delivered a lecture, on "Suction Gas and Gas Engines *versus* Steam," to the Dundee Institute of Engineers. He demonstrated by figures taken from actual working that suction-gas plant consumes, on an average, about one-fourth of the quantity of coal which is required for steam power. The efficiency of a suction-gas plant is 89 per cent., as compared with an efficiency of 70 per cent. from the steam-boiler. The cost of working a suction-gas plant was about one-third of the cost of the working a gas-engine with town gas, and about a sixth of the cost of working electricity plant. A large number of engineers were present; and an interesting discussion took place.

THE CONVERSION OF A RETORT-HOUSE AT CAMBRIDGE.

THERE is substantial ground for all-round felicity in connection with the Cambridge Gas Company. Increasing prosperity is a matter which produces a strong link of contentment between a Board of Directors and the shareholders; and increasing prosperity is the portion of this Company. Prosperity has more than the one criterion of increase in connections, which have since electricity supply was in 1893 added to the services of the collegiate city, advanced from 4251 to 5564 at Midsummer of last year,



The De Brouwer Charger.

and are higher still now, as is also the average consumption of gas per consumer. The latter, with the growth of the prepayment business, is not the experience in all cases. Prosperity has also the production and price tests. And at the recent meeting of the Company, the Directors as also the shareholders passed congratulation first to the Engineer and Manager (Mr. J. W. Auchterlonie) on the fact that, in the first half of 1905, the yield of gas per ton of coal carbonized was 11,095 cubic feet, and, in the second half of the year, 11,081 cubic feet, and then to the consumers on the fact that the Company are now in a position to offer them, as from April next, a reduction of 2d. per 1000 cubic feet in the price of the gas—making it 2s. 10d. Last year the quantity of coal carbonized was 30,473 tons; and the gas produced was 337,889,000 cubic feet. With the reduced price and the spreading business, these figures are likely in the near future to be left behind.

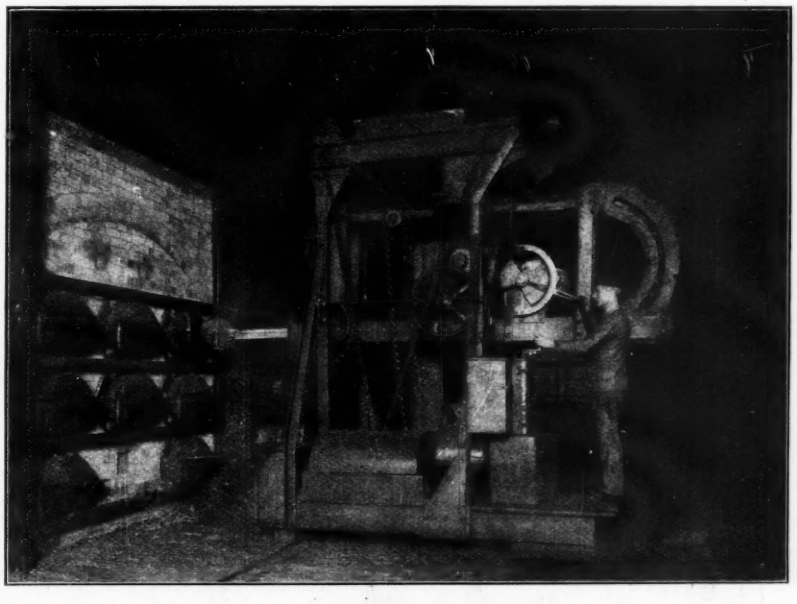
Progress of business means additional productive capacity; and the duty of the engineer of a gas company is to weigh, under such circumstances, the relative advantages in his case of reconstruction and addition, combined with the application of modern invention. In the report that the Directors submitted to the shareholders at their meeting the other day, there appeared these lines: "Both retort-houses are now fully equipped with mechanical stoking apparatus; and the result of the carbonizing is giving entire satisfaction." This indicates the choice that Mr. Auchterlonie made, and that the Directors ratified, in developing the productive capacity of the works. It has taken the form of a complete re-equipment of one of the two houses; and some information about the work will, we know, be of interest to the Engineer's professional colleagues.

THE CONVERTED HOUSE—TAPERED HORIZONTAL RETORTS.

The thoroughness with which the conversion of the house was taken in hand makes it to all intents and purposes a new one. The building previous to the alterations was 123 ft. 6 in. long by 52 ft. wide by 27 ft. high to the eaves of the roof, and was of the ground-floor type, with direct-fired settings. On each side of the house is a coal-store, 30 ft. wide, and 11 ft. 4 in. high to the eaves. These were the former conditions; but to modernize the settings and to obtain a stage-floor house and overhead coal-handling plant, it was necessary to raise the walls as well as the roof of the house by some 15 feet—making a total height from the ground floor of 42 feet.

On the existing foundations, a retort-bench was built, 116 ft. long by 20 ft. through, containing ten beds of through settings of eights, on the regenerative principle. The retorts are of ⌂ section; and, we want to emphasize this—in view of the growing favour of charge projection and spent charge expulsion by ram—these horizontal retorts are tapered from 21 inch by 15 inch on the charging side to 24 inch by 15 inch on the discharging side. Following the approved practice where the spent charges are ejected by rams, each setting has a deep producer on the discharging side only. Another feature that cannot well escape notice is that, instead of ascension-pipes on both sides of the bench, the gas is taken off on the discharging side only, by means of 7-inch diameter ascension-pipes to the hydraulic main, which is connected with seal-regulating valves to the 14-inch foul main. These arrangements represent a considerable saving in structural costs. The tar is taken off direct from the underside of the hydraulic main by two 6-inch mains each having a fall from the middle to the end of the bench (a fall of 1 in 40), where it is connected to a tar-tank fixed near the end of the bench.

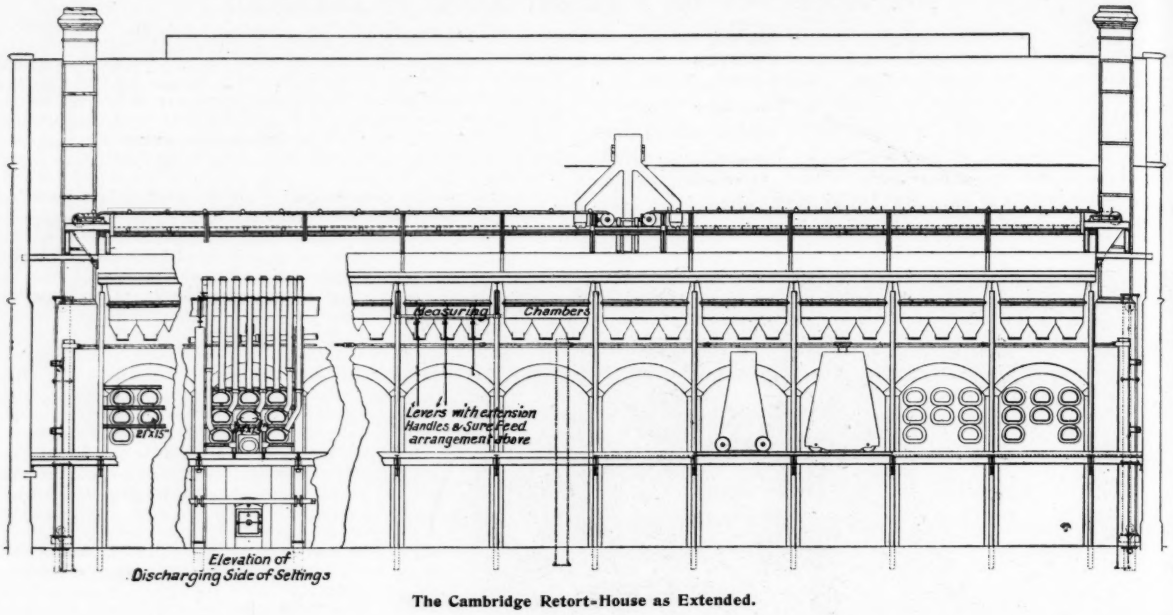
Before proceeding to the other plant, a few words as to the stage-floors. These are formed of brick arches, sprung between longitudinal girders trimmed into the main cross girders, which rest at one end on pad-stones in the retort-house wall, and at the other end on the buckstays. The arches are levelled up on the top with concrete, upon which a blue-brick floor is laid. Cast-iron ventilating-grids are built in the floor at intervals near to the walls; and, on the charging side, a double line of rails of tramway section are fixed on the longitudinal girders for the travelling of the charging and discharging machines.



The De Brouwer Ram.

THE TRANSFER OF THE COAL FROM CART TO OVERHEAD HOPPER.

To the coal-handling arrangements, a little more attention must be given. The breaking and elevating plant is arranged in the coal-store on the discharging side of the house for the convenience of carting. It consists of a powerful double-pair claw breaker fixed in a pit below the coal-store floor-level, over which pit is fixed a receiving-hopper, tapered down on all four sides, and fitted


Measuring Chambers
Levers with extension Handles & Sure Feed arrangement above
Elevation of Discharging Side of Settings

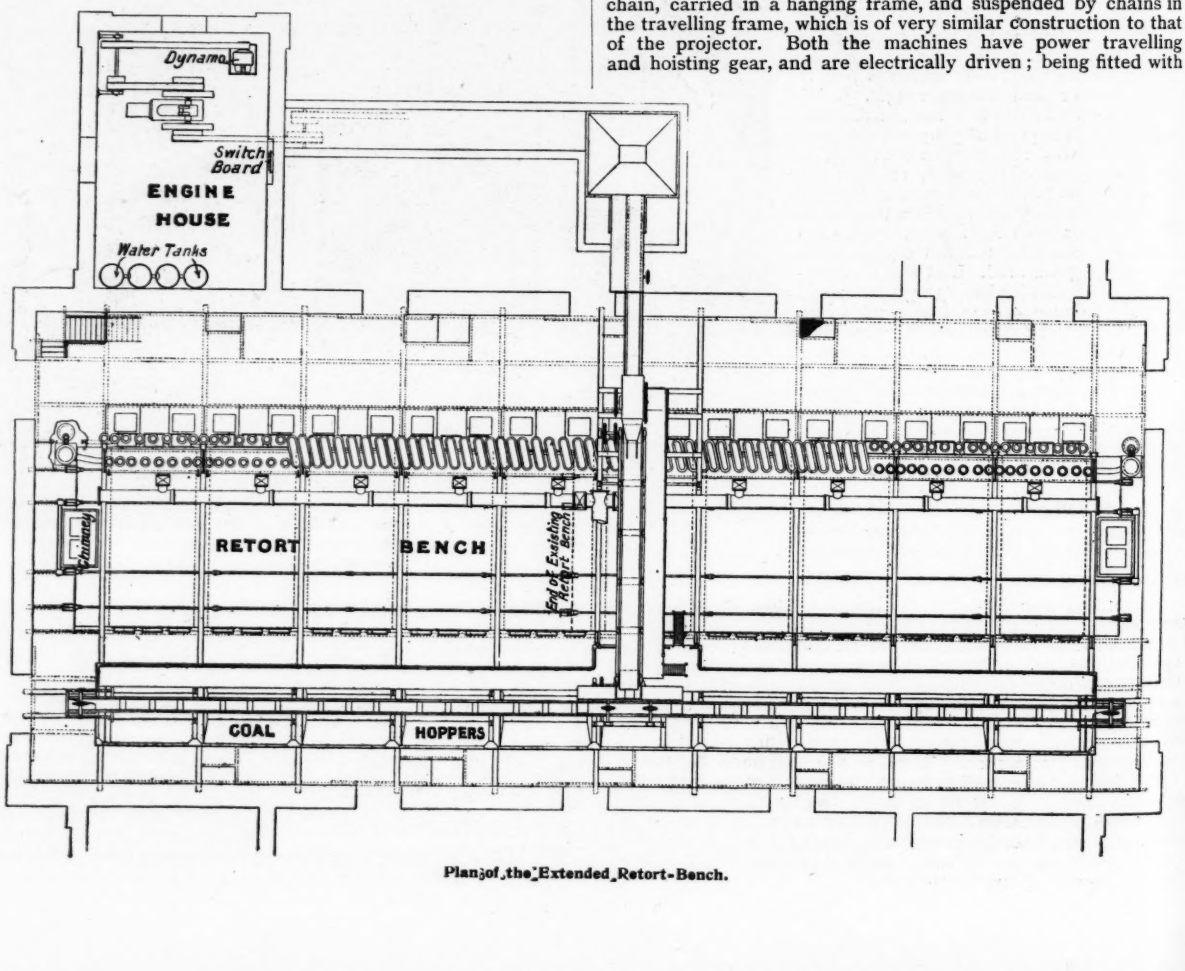
The Cambridge Retort-House as Extended.

with a slide-door for regulating the supply of coal to the breaker. The slide-door is operated by means of gearing and a hand-wheel, arranged in a convenient position above the floor. The location of the works necessitates the coal being brought to the breaker in carts; and, when broken to a suitable size for charging the retorts, it is elevated in the buckets of a latticed frame elevator, and delivered on to a band conveyor spanning the retort-house to the charging side, in turn delivering the coal into a shoot fitted with a flap door, which directs it into the trough of either of the push-plate conveyors. These push-plate conveyors are supported on the continuous storage hopper; each conveyor supplying five of the compartments of the hopper by outlets in the trough fitted with slide-doors. For convenience in attending to the conveyors, a gangway is arranged on the hopper.

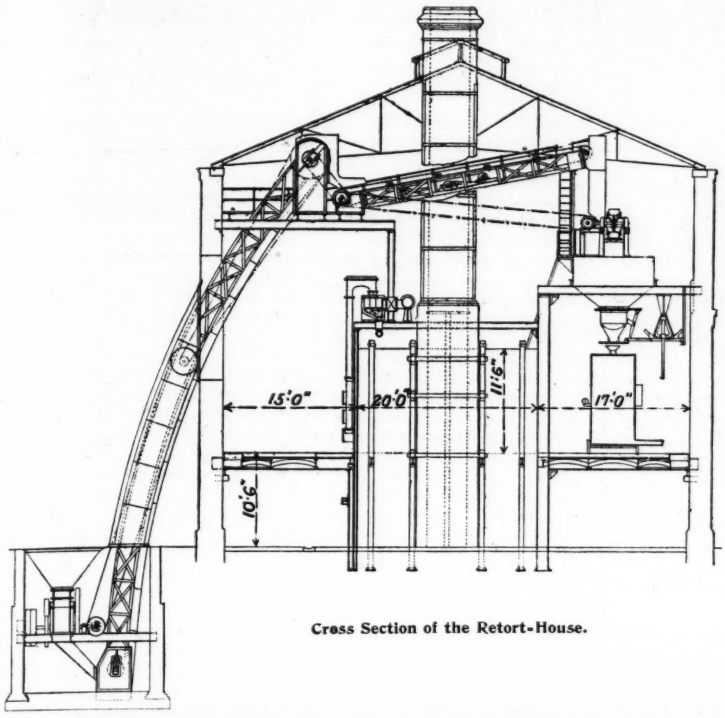
The storage hopper, it should be explained, is 110 ft. long by 9 ft. wide by 5 ft. 9 in. deep, and is divided into ten compartments, one for each setting—the total capacity of the hopper being 120 tons. Underneath each compartment three measuring chambers are fixed, each in vertical line with the retorts. Each chamber is fitted with an adjusting plate for regulating the quantity of coal to be charged, having a range of 7½ cwt. to 5 cwt., in ¼-cwt. steps. The measuring chambers are fitted with slide-doors, both top and bottom, together with levers and quadrants so arranged that the one door has to be closed before the other can be opened.

Coal Projection and Spent-Charge Expulsion by Ram.

Transferring attention once more to the charging-stage floor, it is seen that Mr. Auchterlonie has given preference to a charging-machine of the "De Brouwer" projector type, carried in a steel framework, fitted with travelling wheels. The coal is received from the measuring chambers of the hopper in a tundish, and is directed on to the band of the projector by a telescopic shoot, which allows the machine to be raised or lowered in order to suit the various tiers of retorts. The discharging-machine is of the "Jenkins De Brouwer" type, consisting of a telescopic ram and chain, carried in a hanging frame, and suspended by chains in the travelling frame, which is of very similar construction to that of the projector. Both the machines have power travelling and hoisting gear, and are electrically driven; being fitted with



Plan of the Extended Retort-Bench.



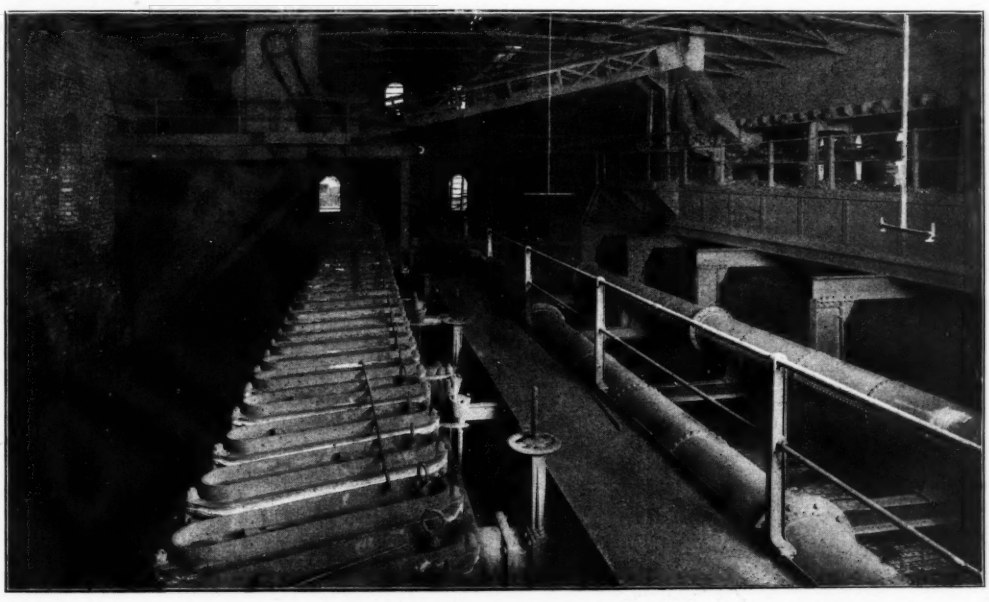
Cross Section of the Retort-House.

motors and the necessary electrical equipment, together with trolley poles, which take the current from two bare copper conductors running the full length of the house. The wires are supported at intervals on insulated brackets.

THE POWER MACHINERY.

With regard to the power required for driving, the coal plant is operated by a gas-engine arranged in an engine-house at the end of the coal-store. This engine also drives a dynamo fixed in the engine-house for generating the necessary current for the charging and discharging machines; the current being carried from the dynamo to a main switch-board arranged in the engine-house, and then to the overhead wires in the retort-house by insulated cables.

For the photographs and explanatory drawings accompanying this description, we are indebted to Mr. Auchterlonie. The house, it will have been gathered from the description, especially in connection with the settings, has certain features upon which something more is sure to be heard in discussions of the subject of retort-bench building for the new method of charging and discharging retorts.



In the Roof above the Retort-Bench.

GAS AND WATER LEGISLATION FOR SCOTLAND.

FOUR applications have been made to the Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899, for Provisional Orders in connection with the supply of gas and water.

The District Committee of the County Council of Dumbarton are seeking power to construct works consisting of a reservoir on Loch Humphrey Burn, a catchwater conduit commencing at the reservoir, and terminating in the stream known as Jaw or Cochno Burn, a second commencing at the reservoir and terminating in another stream, and a conduit or line of pipes commencing at the reservoir and terminating at the Cochno filters belonging to the District Committee. Seven years is the time asked for the completion of the works. The water obtained under the powers of the Order is to be used primarily for the use of the Duntocher and Dalmuir special water district; but the Committee may supply it in the eastern district of the county of Dumbarton within the parish of Old or West Kilpatrick—not, however, to the detriment of the special district. [*Parliamentary Agents: Messrs. Grahames, Currey, and Spens.*]

The Corporation of Dumbarton are applying for authority to construct additional works, consisting of a reservoir in the parish of Arrochar, embracing Loch Sloy, an access road to it, a conduit or line of pipes from it to Garshake, and filters and clear-water tanks—all to be completed within seven years from the commencement of the Order. Power will be sought to borrow not exceeding £150,000 for the purposes of the works comprised in the Order and for the water undertaking generally, to be repaid within fifty years from the date of borrowing; and with regard to a sum of £28,397 remaining unpaid in connection with the water-works, a period of thirty years from the commencement of the Order is required. The Order contains power to take water, to acquire and hold lands for the protection of the works and the prevention of pollution, to supply water to local authorities on the line of pipes, and other usual provisions. It is proposed to extend the boundaries of the burgh; and therefore it is asked that the provisions of the Corporation's Gas Act of 1873 with respect to the supply of gas may have effect as if the limits specified in that Act included the burgh as enlarged by the Order now applied for. [*Parliamentary Agents: Messrs. A. & W. Beveridge.*]

The Corporation of Forfar are making application for authority to construct additional water-works, consisting of an aqueduct,

conduit, or line of pipes in the parish of Tannardice, commencing in the stream known as the Whiteburn, and termininating in the existing well or manhole of the Corporation on the Den of Ogil Burn. The Order includes provisions for securing the purity of the water, and for supplying it at a pressure and a level not greater than can be afforded by gravitation from the service reservoirs or tanks from which it is taken. The Corporation wish to have power to apply to the purposes of the Order any moneys already borrowed or authorized to be borrowed by them, and to raise additional money on mortgage, bond, or cash credit, or in any manner competent to them, on the security of their existing water-works and of those proposed to be sanctioned by the Order. [*Parliamentary Agents: Messrs. W. Robertson and Co.*]

The Perth Corporation are seeking authority to extend the limits of gas supply defined by their Act of 1871, so as to include the burgh of Perth and a number of the adjacent parishes lying within a radius of seven miles from the boundary of the burgh. The powers sought by the Corporation include the laying of differential charges, the supply and inspection of fittings, the lighting of common stairs, and other matters. It is proposed to repeal the provisions in existing Acts relating to the illuminating power, pressure, and quality of the gas, and to reduce the number of candles prescribed in those Acts. The Corporation are asking for power to apply their existing funds to the purposes of the Order, and also to raise more money. [*Parliamentary Agents: Messrs. W. Robertson and Co.*]

WATER PROVISIONAL ORDERS FOR 1906.

In the "Journal" last week we brought to a close the epitome of the Water Bills to come before Parliament in the approaching session. The following are the chief features of the Water Provisional Orders for which application has been made to the Board of Trade.

The Bolsover and District Water Company, Limited, wish to raise additional capital to the amount of £5000, inclusive of premiums; the entire share capital of the Company not to exceed £20,000 without further sanction by Provisional Order or Act of Parliament. The new capital is to be put up to auction or tender, and any not so disposed of is to be offered to the holders of ordinary shares or stock. It is to be entitled to 7 or 6 per cent. per annum dividend, according as it is issued as ordinary or preference capital. Borrowing powers are sought to the extent of one-third of the additional capital applied for, to carry 5 per cent. interest. Should the Order be granted, the charges for water will be based on the gross estimated rental in the poor-rate assessment, instead of the rateable value as specified in the Company's Order, 1903. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Great Grimsby Water Company, Limited, wish to extend their area of supply so as to include a number of parishes in Lincolnshire. Provision is made for the sale of water by meter at a price not exceeding 3s. per 1000 gallons; and the Company ask to be allowed to charge meter-rent not exceeding 15 per cent. per annum on the price of the meter, payable quarterly in advance. The Company do not wish to be bound to supply several houses by one pipe; but should they do so, the owners or occupiers of each house are to be liable for the payment of the rate. Any misuse of water supplied in the way mentioned will render the offender liable to a penalty not exceeding £5. The Company desire to be authorized to make regulations for preventing waste of water. [*Parliamentary Agents: Messrs. Deacon, Gibson, Medcalf, and Marriott.*]

The Herne Bay Water Company apply for power to raise additional capital not exceeding £40,000, including premiums, to borrow to the extent of one-fourth, and to create debenture stock. The new capital is to be entitled to 7 per cent. dividend if issued as ordinary, and to 5 per cent. if as preference; and the borrowed money is not to carry a higher rate of interest than 5 per cent. [*Parliamentary Agents: Messrs. Batten, Proffitt, and Scott.*]

The Hoylake and West Kirby Gas and Water Company, Limited, are applying for power to construct additional water-works, consisting of a pumping-station at Newton, in the township or parish of Grange, in the county of Chester, and a conduit or line of pipes commencing at the pumping-station, and terminating in the existing reservoir of the Company on Grange Hill, West Kirby—all to be completed within the time, and subject to the conditions, prescribed by section 11 of the Gas and Water Works Facilities Act, 1870. The Company seek authority to raise additional capital to the amount of £18,000, including premiums; but the whole of the water capital is not to exceed £75,000 without the sanction of Parliament. The new shares are to form part of the "B" water capital, and are to rank *pari passu* with the existing capital of this class. They are, of course, to be put up to auction or tender, and those not so disposed of are to be offered to the shareholders. The dividend is to be 7 or 5 per cent. per annum, according as the capital is raised as ordinary or preference. The Company's borrowing powers are to be limited to one-fourth of the whole of the water capital. [*Parliamentary Agents: Messrs. Torr and Co.*]

The Maidstone Water-Works Company wish to be empowered to raise additional capital to the amount of £20,000, to borrow to the extent of one-third of this sum, and to create debenture stock. If the new capital is issued as ordinary, it is to carry 7 per cent. dividend; if as preference, 5 per cent. The latter is to be the limit of the interest payable on any money borrowed. The Order contains the usual auction clause. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Mid-Kent Water Company seek authority to extend their limits of supply and raise additional capital. The extension will bring in Biddenden, Frittenden, High Halden, and several other parishes in the county of Kent; and the extra capital required is £40,000, with borrowing powers to the extent of one-fourth, the dividend on which is to be 7 or 6 per cent., according to the nature of the issue. The Company also wish to have permission to create debenture stock. The portion of the Cranbrook District Water Act, 1898, relating to the supply of the three parishes named by the Cranbrook Water Company is to be repealed; and the Company's powers, duties, and obligations with respect thereto are to cease. [*Parliamentary Agents: Messrs. Roberts and Co.*]

The Poole Water-Works Company wish to raise more capital, construct additional works, and extend their limits of supply. The amount asked for is £50,000, carrying borrowing powers to the extent of one-fourth, and a dividend of 7 per cent. if issued as ordinary, and 5 per cent. if as preference capital. It is to be put up to auction or tender, and when a proprietor bids the same sum as any other person, he is to be declared the purchaser. Shares or stock not disposed of in the above-named way are to be offered to the shareholders. Authority is sought to create debenture stock, bearing interest at a rate not exceeding 5 per cent., except with the permission of the Board of Trade. The proposed new works consist of engine and boiler houses and a well in the parish of Corfe Mullen; filter-beds, reservoirs, and tanks at Broadstone, in the parish of Canford Magna; and a line of pipes from the new engine-house to Poole—all to be completed within the time, and subject to the conditions, prescribed by section 11 of the Gas and Water Works Facilities Act, 1870. The Company ask for power to make meters, and to supply water by measure for domestic or other purposes, on such terms and conditions as they think fit—charging a rate per annum not exceeding 15 per cent. of the cost of the meter. Provisions are made for supplying water by agreement in bulk, and also for the use of ships. The extended limits will include parts of the parishes of Corfe Mullen and Lytchett and all Hamworthy. [*Parliamentary Agents: Messrs. Church, Adams, and Price.*]

The Rickmansworth and Uxbridge Valley Water Company wish to be authorized to lay down an additional main, commencing at the boundary of the parishes of Denham and Gerrard's Cross, and terminating at the boundary of the parishes of Langley Marish and Fulmer near the southern end of the road to Gerrard's Cross. The work is to be completed in the time, and subject to the conditions, prescribed by the section of the General Act previously mentioned. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

Application is being made by the Sleaford Water Company to construct and maintain a reservoir on the west side of the existing one in the parish of Quarrington, in the parts of Kesteven in the county of Lincoln, on land already in their possession and occupation. The time for its completion is to be subject to the provisions of the General Act. Additional capital to the amount of £5000, including premiums, is required, to be issued as ordinary or preference, and by auction or tender—unsold shares or stock to be offered to the shareholders. The dividend is not to exceed 5 per cent. on either kind of capital. Borrowing powers to the extent of one-third of the entire capital are sought. [*Parliamentary Agents: Messrs. Taylor, Hoare, and Pilcher.*]

The Slough Water Company are seeking power to raise additional capital not exceeding £30,000, and borrow on mortgage one-fourth of this amount. The capital is to be issued in the usual way; and the dividend upon it is to be limited to 7 or 5 per cent. The interest to be paid on borrowed money is 5 per cent. It is proposed to extend the limits of supply so as to include several parishes in the county of Buckingham, and also the hamlet of Poyle, in the parish of Stanwell, in Middlesex. [*Parliamentary Agents: Messrs. Batten, Proffitt, and Scott.*]

In the course of a paper on phosphorescent marine animals, published in the January number of the "Zoologist," Professor M'Intosh states that there are four distinct modes in which the light is produced. First, there may be special cells which secrete, in certain circumstances, phosphorescent mucus; secondly, special cells may be phosphorescent without the emanation of any visible secretion; thirdly, light may be emitted without any differentiation of tissue under nervous action; fourthly, the phosphorescence may be due to light-emitting bacteria. One of the most striking features connected with phosphorescence is the simplicity of the mechanism by which it is produced and the entire absence of heat. "Thus," writes the author, "the light of a firefly or a Pholas has no sensible heat, whereas a temperature approaching 2000° Fahr. would be necessary to make it by the usual processes, except the Geissler tube. So impressed were Professor Langley and Mr. Very with this feature, that they contrast it with the enormous waste in all industrial methods of producing light. . . . The authors, in view of this remarkable light without heat of the animals just considered, are of opinion that there is yet hope of obtaining an enormously greater result than we do now in the production of light."

PREVENTING FROST IN SHOP WINDOWS.

A recent issue of the "Decorators' Gazette" contained the following article on the above subject, which has special interest for the suppliers of gas at the present season.

During the course of the cold weather, shopkeepers are confronted with the great inconvenience arising from mist and frost in shop windows, whereby the goods on show are rendered practically invisible, and consequently cease to attract customers. In nearly every instance, a careful examination of the window will show that the construction of the woodwork casing, the position of the window panes, or the lack of adequate ventilation, is to blame. For the purpose of studying the question, shop windows may be divided into two classes—those enclosed at the back, and those open towards the store. The former are the more afflicted with mist and frost, and this class alone will be dealt with.

In putting in the window panes, whether the framing be of wood or iron, a row of ventilating holes should be provided below, extending all across the window front. These holes should be broad, and set low down, but not provided with protecting covers on the outside, since they only catch dust and help to stop the draught. The idea is to cause a wide current of air to enter the window, so that it may spread over the whole front; and this is more easily realized with wide holes than by round ones or vertical slits. To prevent an inrush of dust raised by the street traffic or blown about in the summer, a sliding damper may be arranged inside the window, so that the holes may be closed when required.

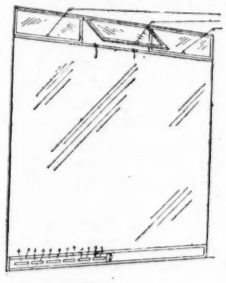


FIG. 1.

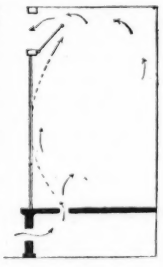


FIG. 2.

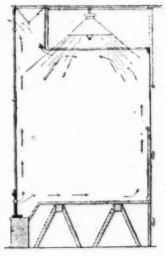


FIG. 3.

Above the level of the window panes, but still within the casing of the window, there should be provided hinged ventilators, as shown in fig. 1, to allow the heated air in the window to escape into the street. For this purpose a row of holes similar to those underneath the window would be insufficient, owing to the increased volume occupied by the heated air; and on this account the upper openings must be of larger area, in order that the circulation of the air inside the window may be intensified. This hinged ventilator must be mounted right at the top of the shop front, and open inwards and upwards, since otherwise it would oppose an undesirable resistance to the outflow of air or divert it, and thus lead to a deposit of mist on the upper part of the window. Furthermore, the inlet holes must be surmounted by a ledge or beading which can deflect the flow of air and allow ice to form. It is an equally erroneous practice to adopt the plan illustrated in fig. 2, and extend the flooring of the show casing right up to the window, and bore a number of inlet holes through the flooring. In order to keep the glass free from frost, the inflowing cold air must ascend close to the window panes and escape at the top without hindrance, as shown in fig. 3. When this is possible, the window will never be dimmed with either mist or frost, since the moisture that would be deposited on the glass is carried away by the ascending current of air the instant that any particles of water are formed.

In some cases, it happens that although the ventilation is believed to be satisfactory, the glass gets dimmed; but this is due to defective construction of the window-frames or of the casing. For instance, if the door leading into the window from the shop does not shut quite tight, or there are cracks or holes in the woodwork, the warm moisture-laden air from the shop flows into the cooler window, and a fine dew is deposited on the panes and mirrors. Hence the doors should never be of the sliding type, as they admit air and dust, but should open and shut, and be beaded and fitted into a rabbeted frame to make them air-tight.

The window lights should be enclosed in glass cases, to isolate them from the actual show space, because in the case of gas the lights would heat the air more rapidly than the ventilator could carry it away; the result being a deposit of moisture on the relatively cold window pane. To prevent this, the light should be isolated by a glass partition, as shown in fig. 3; the compartment thus formed communicating with the shop by means of a hinged ventilator, or left quite open at the back.

The principles underlying the suitable construction of shop windows may be summarized as follows: The window must be thoroughly ventilated, so as to induce a good circulation of air, and bring the temperature of the air inside the window to as near as possible that of the atmosphere of the street. Doors and other openings communicating with the interior of the shop should be made air-tight. If these requirements are properly fulfilled, all complaint of mist or frost on windows will be obviated.

PROTECTION OF WELSH WATER AREAS.

FROM A SOUTH WALES CORRESPONDENT.

The Bill which the Glamorgan County Council have promoted for obtaining authority to establish a Joint Water Board for South Wales, the scope of which has already been indicated in the "JOURNAL," opens out a question which is bound to assume national importance in the immediate future. The circumstances which have forced the hands of the Glamorgan County Council prove that the question of water supply for the large centres of population is entering upon an acute stage. What Manchester and Birmingham have already done, London must, it is thought, inevitably do in the future; and though the London County Council scheme of 1899 has been for the moment shelved, the County Councils of South Wales recognize that, sooner or later, the Metropolis must come to Wales for water. They are therefore determined that when the time arrives the great population in the mining districts of the counties of Glamorgan and Monmouth shall not suffer. It is surely a reasonable proposition that the large centres of population in the immediate vicinity should have the prior claim in the acquisition of suitable gathering-grounds; and this is all that the Glamorgan County Council desire. There is no "dog-in-the-manger" policy about it; for the probability is that, with due arrangement, there will be enough gathering-ground for everybody. But the Council hope that, by the establishment of a central body, they will efficiently protect the interest of the population by preventing powerful corporations from a distance securing the best localities for their own people, to the exclusion of Glamorgan, as experience shows would be only too likely if the protection of the prospective inhabitants of the county is left to individual District Councils or to the action of the County Council with its present limited constitution, which does not include any powers to secure, or even to protect, valuable sources of water near at hand. "It is hoped"—I am quoting now from an official document—"that a constituted central body, with water powers, whether consisting of the County Council specially empowered or a new body constituted *ad hoc*, might be able to make terms with any corporation, even the London Water Board, seeking a gathering-ground, whereby a supply to the county in bulk could be secured as part of any large scheme of reservoirs, to be paid for by those districts that may from time to time need the supply, for far less cost than would be necessary to serve them with either separate or joint supplies when required, even if at the time the sources of supply remained unappropriated by others."

But, it may be asked, assuming that the London County Council scheme of 1899 were carried out *in toto*, would there not still be plenty of available gathering-grounds in South and Central Wales, the supply from which would be ample for the needs of Glamorgan, Monmouth, and South-Eastern Carmarthenshire for many years to come? Two factors enter into the reply to this question: (1) Area of gathering-grounds available; (2) present and prospective population. A glance at a map which has been prepared for the County Medical Officer (Dr. W. Williams), showing the existing and prospective water-works gathering-grounds and pumping-stations, and their relation to the South Wales Coalfield, indicates clearly how large a proportion of the water-collecting areas north of the coal measures is either already appropriated by Welsh or other authorities, or forms part of the London scheme. It should be noted here that the coal measures are not regarded as suitable for gathering-grounds, on account of the danger of the sinking of the ground and of pollution. A line drawn from Kidwelly eastward to a point near Brynmawr, and thence south to Abersychan, indicates the northern boundary of the coal measures; and it is to the north of this line that the rapidly-increasing population of Glamorgan and Monmouthshire and the south-eastern corner of Carmarthenshire must look for their future water supply.

Of Welsh authorities, Cardiff, Swansea, and Merthyr have all gone north of the outcrop of the South Wales Coalfield. Cardiff already has a splendid supply from the Taff Fawr, where there are already two large reservoirs, while a third one is about to be constructed. In the adjoining valley, the Taff Fechan, immediately to the eastward, are the Merthyr Tydfil reservoirs. The total gathering-ground of the latter is about 4368 acres, and the quantity of water supplied per day is estimated at 2,050,000 gallons, which is much greater than the present demand. Swansea has secured a large watershed at the upper part of the Cray Valley, and immediately to the east of this has obtained possession of another great tract of land for future extensions which have been authorized. Neath Rural have secured valuable gathering-grounds at the head of the Vale of Neath. On the borders of Cardiganshire, there are the huge water-yielding areas acquired in the Elan Valley by the City of Birmingham. An extensive watershed lying to the south of these, as well as smaller areas elsewhere, was "ear-marked" for London under the scheme of 1899; and it needs but a glance at the map referred to to show, if this scheme were brought to fruition, how circumscribed would become the number of suitable water-collecting areas for the population of South Wales. This fact will be the more apparent when it is stated that practically all the best gathering-grounds—that is to say, nearly all the land above 500 feet—are to be found eastward of a line drawn from Lampeter or Tregaron southward to Llanelly, and to the westward of a line drawn from Knighton southward to Newport.

The question of population, present and prospective, is an important factor. More especially is this seen to be the case when it is stated that during the intercensal period 1891-1901 the population of the Administrative County of Glamorgan showed an increase of 29·4 per cent.—a greater increase than in any county of England, except Essex, which represents the eastern portion of London. Sixty years ago, the population of Glamorgan was less than a quarter-of-a-million. To-day it is already within hailing distance of a million; and it will exceed a million at the next census. The figures showing the population of the whole county at each census since 1850 are as follows:—

Year.	Population.	Year.	Population.	Year.	Population.
1851 . .	231,849	1871 . .	397,859	1891 . .	687,218
1861 . .	317,752	1881 . .	511,433	1901 . .	860,022

The population of Monmouthshire has also advanced during the same period by leaps and bounds. The figures on the last three occasions on which the census was taken, which amply prove this, are as follows: In 1881, the population was 211,172; in 1891, 252,416; and in 1901, 298,076. It is estimated that at the next census it will approach 350,000. To these totals have to be added the large population in the south-eastern portion of Carmarthenshire. At the last census, the population of the whole county was 135,328; and of this total about 43,800, or approximately one-third, were included in the Llanelly Petty Sessional District. As this does not include the whole of the densely-populated district affected, it may be fairly assumed that about half the population of the county—say, 72,000—may be included in the south-eastern, or the colliery and tinplate, districts.

Summarized, therefore, the population in South Wales for which a water supply has to be secured is as follows: Glamorganshire, 860,000; Monmouthshire, 298,000; and South-East Carmarthenshire, 72,000—a total of 1,230,000. These, let it be remembered, were the figures five years ago; and it is not too much to estimate that at the next census the total will exceed 1½ millions. On the authority of Alderman T. J. Hughes, of the Glamorgan County Council, it is estimated that fifteen years hence there will be a deficiency of at least 10 million gallons of water per day, after all existing and available sources in the county are utilized.

A few observations may, with advantage, be made with the object of showing that the agitation which has led up to the promotion of the present Bill is no hurriedly conceived step. On the contrary, the movement has been of comparatively slow growth; for it was at least fifteen years ago that the late Lord Swansea—a far-seeing man—first introduced the matter to the Glamorgan County Council, of which he was at that time the Chairman. He pointed out that sooner or later protective action in the matter would have to be taken by the great industrial communities in South Wales. The Corporation of Birmingham had already decided upon an attempt to obtain parliamentary powers to acquire land in the Elan Valley. As the result of his Lordship's appeal, a meeting of the Welsh Members of Parliament was held in 1892, and they resolved that the areas of Welsh gathering-grounds available for water supply ought not to be appropriated until the whole question had been thoroughly considered by a Royal Commission; and the late Lord Swansea (then Sir Hussey Vivian) and the late Mr. T. E. Ellis, M.P., were requested to give evidence when the Birmingham Water Bill came before the Parliamentary Committee. This they did. Sir Hussey Vivian contended that the requirements of Glamorganshire, Monmouthshire, and Carmarthenshire were increasing enormously on account of the growing population, and that therefore the needs of these counties should be considered by the Committee before they decided to hand over to Birmingham the watersheds of the Elan and Claerwen. He argued that Birmingham had "decided upon a spot which was practically the only one of suitable character and of sufficient elevation to supply the county of Glamorgan, since in a great part of that county reservoirs could not be constructed on account of the existence of coal workings below." Despite these representations, however, the Bill received the Royal Assent in June, 1892.

For the next year or so the authorities in South Wales allowed the matter to rest; but the scheme prepared and presented to the London County Council by Sir Alexander Binnie, in 1894, with the object of procuring large tracts of land in Wales for the purpose of the London Water Supply, once more roused the Glamorgan County Council into activity; and in 1895 they instructed Mr. J. A. Williams and Mr. Middleton to report upon the subject, and prepare a scheme for their consideration for obtaining water from regions north of the South Wales coal measures. In the following year (1896), this scheme was presented; but, owing to the cost, it was not proceeded with. It was evident, however, that, sooner or later, the matter would be tackled; and Dr. William Williams, the Medical Officer of Health for the County of Glamorgan, again and again urged the primary importance of proceeding with the question. That it has been again taken up is largely due to the determined and outspoken manner in which, in his annual reports to the County Council, he has year after year, for ten or a dozen years, pleaded for immediate action.

Meanwhile, the London County Council had been pursuing their investigations regarding the possibility of obtaining a supply of water from Wales; and the scheme of Sir Alexander Binnie with this object in view received the attention of the Royal Commission on London Water Supply which began its sittings in 1897. The London County Council had in 1896 commissioned Sir Benjamin Baker and Mr. G. F. Deacon to report to them further on Sir Alexander Binnie's Welsh scheme; and their report resulted in considerable modifications of it. But the result of the inquiry by the Royal Commission was to put a stop for the time being to the Welsh scheme; the Commissioners expressing the view that the supply from the Thames and the Lea watersheds would be sufficient for London for another thirty years at least.

Following the publication of the final report of the Commission, the Glamorgan County Council, seeing that immediate danger was over, allowed the matter to remain in abeyance for the time. Last summer, however, as the result of further representations by the indefatigable Medical Officer of Health, the question was again brought up, and Alderman Davies moved that the time had come to go thoroughly into it again. It was eventually resolved to call a conference of the county, borough, urban, and rural district authorities from all parts of the county to discuss the subject. It was duly held at Neath, and was attended by representatives from nearly all the public bodies concerned. The representatives resolved "to recommend the several borough and district councils within the Administrative County to approve of the principle of the County Councils applying to Parliament for the purpose of their being vested with powers that would enable them to obtain protection in any Act which may be applied for to obtain Welsh water; and for getting a supply in bulk for any district in the county desirous of obtaining such supply." The conference was held in the late autumn, and the resolution was duly discussed at a special meeting of the Glamorgan County Council on the 7th of December, when it was resolved to promote, in the next session of Parliament, the Bill of which the main features have been given in the "JOURNAL."

Owing to some unforeseen delay in getting the draft of the Bill placed before the County Council and approved, there was no time to consult with the county authorities in Carmarthenshire and Monmouthshire. The authorities of the latter county, at a meeting held on the 7th inst., at Newport, discussed a recommendation of their Parliamentary Committee to safeguard the interests of Monmouthshire by lodging a petition against the Glamorgan Water Bill. Alderman Raffan contended that if a conference were held between the two authorities, matters might be amicably arranged; and the Parliamentary Committee were given powers to negotiate, and if necessary to petition against the Bill. It is hardly thought, however, in well-informed circles, that any serious opposition will result; and the outcome of the negotiations will probably be that Monmouthshire will lend their influence in favour of the Bill. Breconshire do not consider they stand to gain anything. On the contrary, they think that the granting of such powers as those comprised in the Bill must detrimentally affect them; and at the quarterly meeting of the County Council held at Brecon on the 26th ult., it was resolved to oppose the Bill—Mr. Cowper-Coles remarking that it was quite evident that the great mineral interests of Glamorgan, Monmouth, and Carmarthen were endeavouring to come into line to take water from Radnorshire and Breconshire on their own terms. An official of the Glamorgan County Council has, however, expressed the view that, with such a strong case, the promoters of the Bill will have little of opposition to fear from either Radnor or Brecon.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

There was a good attendance of the members of the Scottish Junior Gas Association—Western District—at their monthly meeting in Glasgow last Saturday evening.

The PRESIDENT (Mr. J. Bell, of Airdrie) occupied the chair. The meeting having been formally opened,

Mr. J. BYRES (Glasgow) submitted a communication on

GAS-METERS.

He said he brought forward the subject from the standpoint of a meter repairer, for there were no meter makers in the West of Scotland. He would begin with the wet meter, seeing that it was first in the field as a measuring instrument, and held its own to the present day, though it had gone out of favour in various ways, through its liability to freeze during the winter months, the trouble it gave to inspectors and managers of small works, and last, but not least, by the way in which pipes were nowadays fitted through buildings. For experimental purposes, however, the wet meter could not be surpassed. About twenty-five years ago, they in Glasgow altered the ordinary meters to the Saunders and Donovan type, in sizes from 5 to 80 lights. From a 5-light meter they could draw three pints of water before the float closed, and even then the water was at the same line; but before they could get the meter to pass gas, they had to replace as much water as would open the valve. This made no difference to the water-line, but simply caused the float to rise right out of the water. With the ordinary vertical valve meter there was quite a different action—they raised the line by adding water. With the ordinary wet meter there were two lines which required to be determined by the prover, called the high and low line. The high line was determined by the revolution of the drum, which, in the case of the 2-light drum would be 0·083, or the twelfth part of a foot. Having found this, they drew off water until they got their meter to run 0·3 per cent. slow. They had to adjust the valve so that it

would close. Should there be any more water taken off, it would stop the flow of gas through the meter.

Having given a description of the construction of a dry meter, the author went on to say that great care had to be exercised with respect to the valves of a dry meter, in order to get the proper alloy of metal. There was a great difference in this respect among meter manufacturers. He had seen meters of no great age with the valves cut into ruts, and making a noise as if there were live-stock inside. The same applied to other fittings of meters. They had some tests made on valve arms, and they found them to vary very much in quality. The other parts—such as the cranks, top arms, and flag or motion wires—required to be well fitted and finished at their moving parts, to reduce friction to a minimum. Within the past few years, the prepayment meter had been much in demand; and this state of matters still continued, for in Glasgow they were kept busy supplying applicants with this particular type of meter. During the last two months, they had received nearly 4000 of these meters. To his mind, if the prepayment meter tended to augment the consumption of gas, it also caused much increase in the way of repairs. This, however, could be minimized considerably if the meters were periodically inspected by practical men, as very often the defect was caused by some slight flaw in the prepayment attachment only.

Mr. Byres concluded by saying they had, in Glasgow, more than 244,000 meters, varying in size from 1-light up to 500-light; and of this number there were only about 1500 wet meters. At the end of last November they had 229,863 ordinary meters in use, and 4899 prepayment meters. In the meter-repairing department, they received every year over 23,000 meters for repair. During the last ten years they had been handing over, on an average, to the fitting department, nearly 20,000 meters per annum; and he was within the mark when he stated that during that time they had not repaired 20 wet meters. This went to show that in Glasgow the wet meter would soon be a thing of the past. In commerce, the measurement of liquids was far from being so exact as the measurement of gas by meter.

In the course of the reading of his paper Mr. Byres showed very fully, by means of meters and drawings, the construction and working of the various parts of the apparatus.

Discussion.

Mr. A. Smith (Tradeston) said it occurred to him that it would be worth the consideration of the Council whether they should not pay a visit to the meter-repairing works in Walls Street, with Mr. Byres as guide. He had had some experience of both wet and dry meters, as the two kinds were much in use in a town where he was at one time, and it was a difficult matter to get people to take a wet meter. He supposed this was due a good deal to the gas-fitters advising them not to take a wet meter, because it would give them trouble. He would like to ask whether the wet meter was not the more durable one, from the owner's point of view, owing to there being less mechanism. The dry meter cost a good deal more at first, but he would pin his faith to the wet meter for accurate registering.

Mr. A. Dow (Kirkcaldy) remarked that in his town they had only wet meters. The statement Mr. Byres made regarding the unpopularity of the wet meter was purely on the part of the consumers. He thought all managers would find the complaint department very heavy where wet meters were in use. He had found it to be so in Kirkcaldy. As to the testing of meters, since inverted burners came in, it had been found that higher pressure was required than was necessary with flat-flame burners. Meters were tested usually at 5-10ths; but the pressure of gas in the mains and at the point of delivery was considerably above this. A meter tested at 25-10ths pressure would show a considerably greater error than one tested at 5-10ths; and possibly it would be better if there were some method of getting meters tested at higher pressures, because, in his opinion, the error was far beyond 3 per cent. He had tested one or two wet meters at Kirkcaldy, and he found that up to about 35-10ths they had often a slowing of the meter up to 7 or 8 per cent.—the water-line being correct and everything under fair conditions. The meter gradually slowed up with the increase of pressure; showing a false registration. Mr. Byres had pointed out that it would be advisable to have prepayment meters examined periodically by practical men. This would be a very good plan, because in nine-tenths of the complaints it was the prepayment attachment that was at fault. Therefore it would be to the interest of managers to study which was the most reliable in the matter of the prepayment attachment. They had meters of all makes in use, and they found that some gave them little trouble, while others caused a great deal; and it was all in connection with the prepayment attachment. The Warner and Cowan drum, he thought, was a capital one for a wet meter; and the Saunders and Donovan float was about the best he had seen. They had meters in Kirkcaldy the like of which he had never seen. However, they were getting them taken out, and they found in many cases they were going considerably slow, giving an increase of unaccounted-for gas.

Mr. J. Dewar (Glasgow) asked if a meter had been brought out for measuring gas in bulk. He had heard of a direct dry meter, similar to the Siemens water-meter; but he would like to know if there was any hope of it coming.

Mr. J. Lowe (Glasgow) remarked that Mr. Byres was very careful about his position being only that of a meter repairer. He thought Mr. Byres had been far too modest, because he fancied that, with his long experience with various kinds of meters in the repairing shop, he knew more about the weak points of meters than many makers.

Mr. J. Macleod (Provan) said he had something to do with the testing of the metallic slide-valves, and the difference in the composition of the metal used by the various makers was very great. One thing which made meter-valves go wrong was the condensation of some of the tarry matter upon them, causing them to stick. This, of course, could not be very well avoided. Mr. Byres said that dry meters never gave any trouble through requiring water to be taken away from them. He (Mr. Macleod) thought that on one or two occasions Mr. Byres had found that dry meters needed the removal of water. At least, he knew that he got a sample of stuff taken from a dry meter which was so bad that the office staff objected to his handling it.

Mr. D. Ure (Glasgow) pointed out that very little had been said about the prepayment meter; and he said he should like to know whether it or the ordinary meter was the best for the consumer and for the supplier of gas.

Mr. W. Wilson (Kirkintilloch) remarked that the author had been very careful not to mention makers' names, and not to put one meter before another; and in this respect he had been very wise. But it struck him (Mr. Wilson) that Mr. Byres should not be repairing meters, but making them. He did not see why the Corporation of Glasgow should not make meters. Mr. Macleod had brought up the question of the composition of the alloy for the slide-valves. He (Mr. Wilson) might tell him that he knew something of the reasons for adopting different proportions of metals for making up the alloy, and he thought it was more a question of price than anything else. Mr. Byres had not touched upon the vexed question of universal couplings. To the man who went round and put in meters, this was sometimes a very sore question. Universal couplings had been proposed and recommended to the Board of Trade; but they had not been adopted by meter makers generally, who liked to keep to their own couplings. He saw a rather good idea put forward by one meter maker—a sort of half coupling (a short piece) screwed female at the one end and male at the other. The female end fitted a 3-light, and the male end the tail-piece of a 2-light meter. If they wanted to remove a 2-light and put in a 3-light meter, all they did was to take out the short insertion piece. The wet meter was going out of use; and it certainly lent itself much more easily to the manipulation of dishonest people. One of the things which led to the discredit of wet meters was the trouble they gave; and wherever he could, he preferred to scrap them, and replace them with dry meters, He had taken out some very old meters, both wet and dry. One was by Thomas Glover—a dry meter—put in as long ago as 1862. It was registering within the limits of the Act, which was certainly a record.

The President said he would just add his thanks, along with the rest, to Mr. Byers for his paper.

Mr. Byers, in replying, said the meter couplings had been standardized since 1902. But he thought a mistake had been made, especially in the larger sizes. They ought to have kept the 50 and 60 light meters the same as the 100-light. In Glasgow they were now busy changing the couplings. Every meter they repaired, except the older ones, left the shop standardized. With regard to prepayment meters, it was only the mechanism that they had to deal with; it was not the meter at all. The whole of the prepayment meter makers were running in the same groove; but some had a better arrangement than others. Some had a prepayment valve which they could get at easily; whereas they could not get at others without undoing the stamp of the meter. Some had springs for prepayment valves. In his opinion, any prepayment meter which had a spring about it ought to be discarded. They should have something they could take away in their hand, and leave the meter alone. The position he took up was that of a meter repairer, and he would not mention one maker's name more than another. He thought that in Glasgow they had about twenty different makers' meters in use; and he knew pretty well what the meters were like. It was quite true, as Mr. Smith had said, that there was very little work about a wet meter. They had more motions within the valve-box in a dry meter than they had altogether in a wet meter. He had himself taken out a dry meter which was full nearly to the top with the product of condensation; but many people blamed the unpurified gas for this. As to testing meters under heavy pressure, this could very well be done; but they would first of all require to alter the Sale of Gas Act. They tested their meters at ½-inch pressure, as laid down by the law. They knew very well that the meter makers did not do this, because it would not pay them to do it. There had been some agitation in England on the subject; and it was time something was done, because the pressure had of late years been increased.

Mr. John Allan (Glasgow) read a paper on

GAS-FITTING.

He said it was not his intention to deal with gas-fitting in general, but rather to devote a little attention to the economical fixing, proper adjustment, and general advantages of heating rooms by gas-fires. The adoption of gas for heating had only come into use within the last few years; and it was recognized by scientists and by the medical profession as one of the factors in preventing

the pollution of the atmosphere of cities. In the report for the year 1882 of the Smoke Abatement Society, they found a description of the "coke-fire" lit with gas, invented by Dr. Siemens, as likely to help in reducing the smoke nuisance, and lead to the extension of the use of gas for heating; but it was believed that it would increase the risk of fire. This opinion had altered greatly since then, as one of the advantages of the gas-fire was that it reduced the danger of conflagration to a minimum. At the meeting of the Society the same year, Mr. Thomas Fletcher, of the well-known firm of gas-stove makers, gave a description of a new form of gas-fire, with an illuminating flame, which was just the tube radiator of to-day. Then there was the Leoni fire, on the bunsen principle, composed of a flat fire-brick, with asbestos threads attached to it, on which the flames played. It was said that this burned only a halfpennyworth of gas per hour, and that it could be fixed to an ordinary gas-bracket by an india-rubber tube. This was a mode of fixing which none of them would recommend. But of late there had been great improvements in portable connections, by the introduction of metallic tubing. In another fire, with no flue, the idea was to have trays of unslaked lime, which the products of combustion had to pass through, and that thereby carbonic acid gas was absorbed—similarly to the process of purification in a gas-works. Then they had Mr. Fletcher's simple arrangement of a gas-fire, which had a number of upright bunsen tubes placed in front of the grate-bars, but inwards, so as to inject the flame into the body of the fuel in the fire-recess. In May, 1884, Mr. Wilson invented the frame-fire, which was composed of a frame, with a back brick, and cast-iron frets placed in a horizontal position, attached to the frame and brick, through which the flame played, and which was known as the iron-fibre fire. This fire, with the exception of a few minor improvements, still held its own with the best fires for efficient heating; the only drawback being the rapid burning away of the iron fretwork. In 1886, Mr. Foulis—no mean authority on all matters relating to gas—applied his busy brain to the improvement of gas-fires; and they saw the result in his well-known "regenerative gas-fire."

Of the many arrangements for heating rooms by gas, he knew of none to surpass a well-built "canopy-frame fire," a class the most of which were economical in the consumption of gas and efficient in the heating of rooms; and they were artistically designed. Such frame-fires should be placed well in front of a room grate, and with the fire-opening of the grate closed with sheet iron, leaving only a 2 or 3 inch hole for the flue-pipe. The canopy stove was even better suited for rooms with no grate at all. In such cases, all that was necessary was to fill in the openings between the jambs with glazed bricks or tiles. No doubt most of them knew that the simplest arrangement of a gas-fire was that of placing a burner and brick, with ball fuel, in an ordinary register grate. This type of fire was most in general demand; but for the amount of gas consumed it was not so economical, nor did it give out so much heat, as a frame-fire. Many a time he had felt the heavy front-bars of the ordinary register grate considerably obstructed the radiation of the heat from the fuel; and it had occurred to him that some better arrangement could be devised to do without the bars altogether. One plan which suggested itself was to place along with the ordinary back brick two side bricks. This would require the burner to be a size smaller, which would make the fire more economical. Then they would need a light cast-iron or wire frame, to keep the fuel in its place; and if they reduced the number of pieces of fuel from six or seven dozen to about three dozen, the waste of heat through the sides and back would be reduced to a minimum, and they would have converted, as far as practicable, a consumer's grate into a frame-fire.

Where there was no flue available, as in the case of shops, corridors, and halls, lustre and tubular stoves, often called neutralizers, were very efficient. He had frequently been puzzled to know why they were called neutralizers, because they knew that one of the chief products of combustion was carbonic acid, and the water absorbed carbonic acid gas up to the point of saturation. But what about the rest? Perhaps some of their chemist friends would clear up this point. The latest addition to this class of stove was the gas-heated steam-radiator, which was a very effective heating agent, with a low consumption of gas. In the course of his daily work, he had to deal with complaints arising from the fires not heating the rooms satisfactorily. The want of heat was due, in most cases, to improperly adjusted bunsens, too small supply pipes, badly built fuel, the gas and air not being properly proportioned, or the fuel being crushed down on the nozzle of the burner, not leaving sufficient room for combustion. The combustion space was a most essential point; for if that condition were neglected, all the other conditions of a gas-fire (however well the work was done) were completely nullified. One notable effect of hindering combustion at its proper place—under the fuel—was seen in its attempt to re-burn on the top of the fuel, by shooting up in streams. What really was required, in addition to plenty of combustion space, was that the flame should neither be too hard nor too soft, nor yet have any white in it. The first defect was removed by admitting a little more gas. The second they might have no control over. It might be weakness of pressure; and if found to be due to small pipes, this could be easily remedied. The third defect would arise from excess of gas; and it would be easily rectified by merely reducing the injectors. But this reduction must not take place at the crane, or else the evil would not be cured. If these conditions were adhered to, with attention to extra ventilation of the room, the fire would be found to heat well, no smell would arise from it, and many of the prejudices against gas-fires, as being unhealthy, would be removed. In addition to the troubles arising from the fires themselves, many complaints were due to small fittings. No one need expect to deliver (say) 25 to 30 cubic feet of gas through a $\frac{3}{8}$-inch pipe at 1 inch pressure. Especially when the length of the pipe was from 30 to 40 feet, not less than $\frac{1}{2}$ inch would do. If the length of pipe was from 30 to 60 feet, a $\frac{5}{8}$-inch pipe was absolutely necessary, or else the loss of pressure would entirely destroy the effectiveness of the fire, by keeping back the quantity of gas the fire actually required. This was no theory; he had seen it in practice many a time. The having of 1-inch pressure at the fire was all-important—they might have more if they liked, but never less. It was their duty to see that the consumer got full value for the gas used.

The number of fires could be greatly increased; but the only way in which he could see that this could be done was to hire them out on similar lines to cookers. It was but natural that this should be done by gas companies and corporations. Hiring them out would remove friction with the trade. In many cases the reason for not getting in a gas-fire was the first cost in fixing them, and in re-fitting them on removal. Very often, on removal, the gas-fire would not fit the grate; and as the people would not go to the expense of a new fire, the gas department lost a customer. If gas-fires were hired out, and if cookers and fires were hired together, they could be both fixed at the same time. In this way, a saving would be effected. The average cost of fixing a ball-fuel fire was about 20s.; and as the outlay on maintenance would be very low, they could be hired out at a moderate cost. As most of the grates belonged to the landlords, very often when a removal took place, the incoming tenant would retain the fire.

There were some tests of gas-fires, showing the differences in the consumption and heating:—

Pressure in Tenths.	Frame Fire. Cub. Ft.	12-Inch Register Fire. Cub. Ft.	12-Inch Ball Fuel Fire. Cub. Ft.
8.	15	24	28
10.	18	26	30
12.	20	30	36
14	22	33	40
16.	23	36	42
18.	24	38	44
20.	25	40	46
	Raised the temperature of room 9½° Fahr., with a consumption of 20 cubic feet in one hour.	Raised the temperature of room 10° Fahr., with a consumption of 30 cubic feet in one hour.	Raised the temperature of room 10° Fahr., with a consumption of 30 cubic feet in one hour.

Discussion.

Mr. J. Macleod (Glasgow) thought that Mr. Allan was perfectly right in what he had said about carbonic acid. Water would only take up so much carbonic acid, and the rest would escape. It might be got rid of by working a small purifier on the top of the stove, which, of course, would be absurd.

Mr. J. Lowe (Glasgow) said it used to be considered that the gas engineer's and the gas company's duties ended at the meter. But a change had come over things; and Mr. Allan had taken them past the meter into gas-fitting, chiefly gas-fires. In his opinion there was a great future before the gas-fire, because the use of gas for heating would probably extend very largely. But in order that it should do that, they would require, it seemed to him, to have certain improvements effected—first, in the fires, and, secondly, in the design of houses and in the views of architects in regard to ventilation generally. He did not know that there was any great objection to carbonic acid. Carbonic acid gas could not be called poisonous. They breathed it every day, and it also formed the gas which gave the effervescing quality to drinks. Heating by gas-fires might be divided into two classes—internal and external heating. By the latter he meant the heating of passage ways, corridors, and places where there was a free circulation of air; and by the former, apartments as they were constructed at the present day. There could be no objection to the use of flueless gas-fires in corridors, where there was a free circulation of air; but even in this case he considered it would conduce to economical heating if the heat were as much as possible taken away from the products of combustion before they were allowed to escape. Of course, they had stoves which did this; but where the products of combustion came off with the heat, they immediately rushed to the roof, and he thought that if they could be separated, and the heat thrown out at a suitable level, it would be an advantage. As to internal heating, a radical change was required, not so much from the point of view of the makers of gas-fires, as from that of architects. Hitherto a chimney, with an ordinary grate, had served chiefly as a ventilator. The products of the combustion of the coal ascended continually, drawing in a large volume of air and sending it up the chimney. The same thing occurred when they put a ball-fuel gas-fire into a grate. The heated products of combustion passed off very hot, and they were drawing air from the room, which did not tend to produce efficient heating. He did not think the floor of the room, under the level of the grate, was the right place to take off the air for ventilation. It should be near the roof; and then, by means of a gas-fire, which would discharge the products of combustion into the vent, which would not be open to the atmosphere of the room, the heat would be taken away entirely from the products of

combustion. In this way they would get more efficient heating, and at the same time do away with the objections that were made to the use of gas-fires. He believed that the charges of stuffiness and the like which were brought against these fires were not due to the fire, but to the closing up of the ordinary means by which ventilation must take place, and not providing others.

Mr. W. WILSON (Kirkintilloch) remarked that the author's table, setting forth the varying consumptions of gas with different fires, showed that he had been at considerable trouble in preparing his paper. He (Mr. Wilson) was not altogether of the same opinion as Mr. Lowe with regard to carbonic acid. He would not make light of it. He suggested that the products of combustion should, if possible, be carried away in a special flue to the open air. If they were put into an ordinary vent, they were sometimes not carried away. If the vent had a bend and a long slope, the carbonic acid was apt to fall to the bottom side of the sloping portion, and, being heavier than air, to go back into the room. He agreed that 20s. was about the average cost of fixing a gas-fire; and he thought Mr. Allan was also right with regard to pressure. They could not have too large pipes to these fires.

Mr. LOWE explained that his view was that, where proper ventilation existed, carbonic acid might be considered a negligible quantity.

Mr. J. MACLEOD remarked that Mr. Byres, in his reply, seemed to suggest that sometimes the gas might not be thoroughly purified. He seemed to think that in the old days, when really good gas was being made, there was less condensation than now occurred; but he thought most gas makers would agree that with a rich gas the probability of having a large amount of condensation was much greater than with the poor gas of to-day.

Mr. J. DEWAR (Glasgow) said that at present the calorific value of gas was generally very far behind that of coal, but not greatly so if it was properly used. One thing which created a prejudice against a gas-fire was the fact that one could not "poker" it. People liked something they could handle with vigour, such as a coal fire.

The PRESIDENT, referring to the steam-radiator, said he thought it was an apparatus which had come to stay. If these things were pushed among consumers, gas-fires would obtain a better hold. They had tried a few of them in Airdrie, and they were giving the greatest satisfaction. Gas-fires in general were not very popular with consumers, owing to the large consumption of gas. Makers, so far as he could learn, were trying to reduce this. Heating by radiation would, in his opinion, be the means by which to improve the position of the gas-fire.

Mr. A. DOW (Kirkcaldy) remarked that, for register grates, there was a basket fire, in the use of which the front bars of the grate were removed entirely, and the basket put in the fire-box. It looked very pretty, but it had the defect of the others, that a great quantity of the heat went up the chimney. The remark made by Mr. Allan with regard to the placing of the fuel was very important, particularly the laying of the lower portion so as to get proper space for the flame. He was struck with this in a fire which he saw in an exhibition in Edinburgh. The fuel was so placed as to direct the flame into the mass, and it was almost impossible to see the bunsen flame.

Mr. ALLAN, in reply, said the only objection he had to the basket fire was that it very often left a space at the sides; and then he did not like to see the connection at the front—it should be at the back. The President had spoken of the large consumption of gas. In his table, the ball-fuel fire was a basket fire, and they would notice that it consumed 16 cubic feet of gas more than the frame fire, and only gave half a degree more heat. So they would see that there was need for a more economical burner being placed on the market to put into register grates. As to the economy of gas-fires, it was often forgotten that their use enabled servants to be dispensed with. Sometimes difficulty was experienced in the lighting of gas-fires. If they turned on the gas for a little, then turned it off, then on again, and lighted it, there would be no explosion. It was the air gathering in the burner which made the explosive mixture; and this process had the effect of clearing out the air. They had to educate the trade as to the putting in of gas-fires. He knew of some which were properly put in at the first; and they had been in use for nine years without being touched. The only trouble he could see with the gas-fire was in its protection. Sometimes stuff was dislodged by gales and otherwise, and, coming down the chimney, gathered about the burner of the gas-fire. If people were properly instructed as to their use, they would place a cloth over the fire when not at work, and all such risks would be avoided. Ventilation was a very important thing. He generally advised people to keep their windows down about an inch from the top. He did so at home, and he never experienced any ill-effects from the use of a gas-fire. Architects required to be educated as to the use of these fires. He had seen houses erected where it was intended that there should be seven or eight gas-fires, and yet all the chimneys were of the ordinary size, as if for coal; whereas if the chimney had been reduced to 3 or 4 inches, and other means of ventilation provided, the fires would no doubt have been a success.

The proceedings then closed.

The Midland Junior Gas Engineering Association.—We learn from the Hon. Secretary (Mr. James Hewett) that, by permission of the Aldridge Colliery Company, a visit has been arranged to their collieries and brick-works at Aldridge next Saturday.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Visit to the Lofthouse Colliery.

Visits to works form an important and much-appreciated part of the service that the Junior Associations can render to their members. These, in many cases, have been employed on but few different works—often on but one—and their opportunities of seeing others have been limited; so that a wisely planned variety of visits, with the courteously ample description and facilities for full inspection that are uniformly extended, counts for much, especially as in informal conversations among themselves the members usually thrash out pretty completely what they have learned from the visit.

In pursuit of their endeavour gradually to cover the whole field, the Yorkshire Junior Gas Association visited last Saturday a typical colliery at Lofthouse, near Wakefield. The members were met by Mr. Armitage, the Managing-Director, Mr. Eley, the General Manager, and several other officials of the Company, who took them over the whole of the surface works and to many parts of the underground workings. Despite the very unfavourable weather of the morning, a large muster assembled; and the evident pleasure afforded by the visit, emphatically expressed as it was over tea, was ample justification for the somewhat novel departure from the ordinary round of meetings. The weather during the afternoon—at Lofthouse, at least—was a great improvement on that of the morning; so that the above-ground part of the programme was carried out in comfort. The washing, screening, and conveying plant was duly visited and examined, as were also the long series of beehive coke-ovens, the mechanics' shops, and the engines.

The pit was, of course, not in work; but a number of the pitmen had come on duty to give exhibitions of coal-getting, &c., at various parts of the coal-face. Much appreciation was expressed of the services of these men, whose ready and genial assistance and kindly readiness to answer questions added so much to the profit of the visit. One feature of exceptional interest was the electrically worked coal-getting machine, to see which actually in operation the whole body of the visitors wriggled along a 2 ft. 6 in. high gallery, and lay in all attitudes round the machine. Another and still more unusual feature of the colliery is a supply of natural gas, which was by accident found emerging from a small bore made for another purpose, and which is now conveyed by pipe and utilized in some of the coke-ovens.

From the highest to the lowest of those connected with the colliery, nothing was left undone that could be thought of as at all likely to add to the enjoyment and comfort of the visitors. This was evidenced by the considerateness which avoided the contemplated terrors of a rapid descent of 365 yards, by sending the cages down with unusual slowness; and the concluding and conclusive proof was furnished by the final invitation to a most welcome tea, which had been provided by the Company in the offices, to the lavatories of which the members had returned to remove the visible proofs of the thoroughness with which they had carried out the underground inspection, and to resume the dress of ordinary Saturday afternoon life.

During a pleasant interval after tea, spent in the usual fashion, a vote of thanks to the Company and their officials, and to all who had joined in making the visit so memorably interesting and enjoyable, was enthusiastically passed, on the proposition of Mr. Parrish, seconded by Mr. Cranfield, and replied to by Mr. Eley, the General Manager.

The Liége Exhibition Diplomas.—Mr. Imre Kiralfy, the Commissioner-General of the British Section of the Liége Exhibition, has received notice from the Belgian Government that the diplomas of honour as well as the gold and silver medals awarded to British exhibitors will be forwarded to him at the latter end of next month.

The Manchester and District Junior Gas Association will next Saturday pay a visit to the Hollinwood Gas-Works of the Oldham Corporation, permission having been granted through the kindness of the Engineer (Mr. T. Duxbury). As the President of the Association (Mr. J. E. Dudley) is connected with the Oldham Corporation Gas Department, it is hoped that there will be a large attendance of members. The annual dinner of the Association takes place at Manchester on Saturday, March 3.

Australian Coalfields.—A paper read by Professor T. W. E. David before the Sydney University Engineering Society, and reported in the "Sydney Morning Herald," gives remarkable estimates of the coal resources of Australia. Assuming that 4000 feet would be the limit down to which coal could be profitably worked, it is calculated that there is a total of 150,000 million tons of coal still available in the palæozoic coal area of New South Wales, and a like quantity in Queensland. The great Morwell brown coalfields in Victoria are described as being the thickest masses in the world—consisting of two seams, one 265 feet and the other 227 feet in thickness; but the calorific value of this coal is greatly lessened by the high percentage of water which it contains.

TIGHTENING LEAKY HOLDER TANKS.

In a recent number of the "Journal für Gasbeleuchtung," Herr G. Hartmann, Director of the municipal gas and water works at Kreuznach, describes the method he has successfully employed for rendering water-tight some old gasholder tanks which were constructed of masonry.

The tanks in question date from 1858 and 1872. Their sides and bottoms were built of stone, lined with 16-inch brickwork set in trass mortar containing some cement, and finished with a coating of cement mortar. A few years ago, these tanks had become so leaky that they could only be kept partially full even when a constant supply of water was given them. A first attempt to stop the leakage was made by removing all the plaster, cutting out the visible cracks deeply with chisels, and making the whole good with sound cement mortar. In a few weeks' time, however, the water began again to escape. Herr Hartmann then became acquainted with an apparatus patented by Wolfsholz, of Barmen, for injecting under a pressure of 1½ or 2 atmospheres a cream of cement or cement mortar into leaky brickwork. The tanks were again emptied, the cement plaster was removed from over the cracks, and the latter were cut out 3 or 4 inches deep. At distances of 1 or 2 feet along the cracks, 1-inch holes were drilled right through the brickwork, and the holes were cleaned out with water under pressure. The Wolfsholz apparatus was then used to inject a cream of cement into the holes; its conical nozzle being fitted with a piece of rubber tube to insure a tight joint. When the cement was eagerly taken up, and did not flow out from the neighbouring holes, a cream of 1 part of cement with 2 parts of sharp sand was used. In some places 55 gallons or more of the paste was injected into a single hole, showing what large faults had developed in the stonework behind the bricks. When this work was done, and the cement had set, the portions of the cement plaster cut out were filled in, and the whole surface was compo'ed over with neat cement and hair (felt). As soon as this was dry, two coats of "Siderosthen" paint were applied; and finally the water was admitted.

The tanks remained perfectly tight till the time of writing—*i.e.*, for a period of fourteen months. The injecting apparatus can therefore be recommended for its efficiency and convenience in use. It is, moreover, economical of cement.

MONAZITE SAND.

An article from the pen of Dr. C. Richard Böhm upon monazite sand from a geological, chemical, and commercial aspect appeared in a recent issue of "Die Chemische Industrie;" and from it we extract the following interesting particulars.

Deposits of monazite sand of commercial importance are found in the alluvial matter of rivers, and in the subsoil underneath, as well as in beds of sand on the seashore. Such deposits are only to be met with in countries which were not at one time exposed to the eroding action of prehistoric glaciers; so that large portions of the earth, especially in the northern hemisphere, do not contain the mineral. Where glaciers did not grind away the rocks, deposits of "saprolite" or weathered rock are found *in situ* from 50 to 200 feet in thickness, unless this detritus has been since washed away by the action of flowing water. Through the long-continued action of the water, the saprolite has been ground still finer, and has collected in and under the beds of rivers. Here it has been exposed to a process of elutriation—the heavier constituents being left behind first; so that if the original saprolite contained monazite, which has a specific gravity of 4·9 to 5·3, the latter is found accompanied by rutile, brookite, menaccanite (titaniferous iron), magnetic iron ore, granite, hornblende, felspar, quartz, &c. On the seashore, the pounding action of the waves has similarly broken the crystals of minerals containing monazite; and the water has removed the lighter substances, leaving the heavier matter behind. In Brazil, the most important deposits of monazite occur on the coast in the extreme south of the Province of Bahia. Here, however, the mineral is still being exposed to the waves and to the flow and ebb of the tides; so that, though rich beds of monazite may be discovered in a certain place of to-day, to-morrow they may have vanished to an inacessible position.

As far as is known at the present time, deposits of monazite worth working are only found in North and South Carolina (U.S.), on the coast of Brazil, on the banks of the Senarka River in Russia, and in a few places in Australia; but the two last localities have not yet been thoroughly investigated. A red-brown monazite containing 25·02 per cent. of cerium oxide, 22·41 per cent. of lanthanum and didymium oxides, 18 per cent. of thorium oxide, and 28·23 per cent. of ferric oxide has been discovered in New Granada; and a crystalline mineral of the same colour, but containing rather more thoria, is known in the Transvaal, and has been sent to Hamburg. The thorianite of Ceylon, lately described by Dunstan and Ramsay, contains 72 or 76 per cent. of thorium earths; but though several hundredweights of this substance have been investigated by Ramsay, it is not yet known whether the beds are worth working. The monazite deposits in the Carolinas extend over an area of 1600 to 2000 square miles; but hitherto it has only been found possible to work them profitably in widely separated spots. The chief places are the banks of the Silver, South and North Muddy Rivers, the Henry and Jacobs tributaries of the Catawba, and the First and Second Broad Rivers. These streams come from the South Mountains, an eastern projection of the Blue Ridge. In a few of the mountain lakes, the deposit of monazite is 18 feet deep; but this is quite exceptional, and in the river beds it is usually from 1 to 2 feet thick. The proportion of monazite in the original sand varies a good deal—from traces to some 1 or 2 per cent. The superficial deposits were worked out in 1896; and since that time deeper lying material has been won. To do this, holes 3 or 6 feet deep are dug; the upper part of the ground being thrown aside. The product is then elutriated with a feeble current of running water, exactly as is done in "placer" gold mining; but this treatment does not remove the heavier minerals (see above) from the monazite, so that a washed sand containing 65 to 75 per cent. of monazite is regarded as of good quality. Very often a low-grade sand is concentrated by causing it to flow in a dry state out of a narrow tube, so as to fall from a height of 4 or 5 feet upon a level table. When a heap is formed, the lighter ingredients and a little of the finer monazite particles collect round the base of the heap, whence they are withdrawn by constant brushing with an ordinary clothes-brush. In other places, a similar heap of light matter and fine monazite is produced with the aid of a winnowing machine. Naturally, however, the concentrated product of these crude processes is not pure, but retains 25 to 35 per cent. of foreign matter, principally composed of rutile, granite, &c. The loss of monazite is also considerable, and the operations are tedious. In the North Carolina factories of the New York Welsbach Company and of the National Light Thorium Company, a magnetic method of concentration by means of the Humboldt apparatus is employed; and the same system has just been introduced into Brazil.

With the exception of Norwegian monazite, which contains 4·9 per cent. of thorium oxide, the monazite of commerce is of three kinds: (1) Brazilian monazite, a fine amber-yellow body which has been subjected to much natural friction. (2) Carolina monazite from Cleveland County, in well-formed sharp yellow crystals, mixed with the components of the local laterite (chrome iron stone, titanite, granite, and zircon). (3) Monazite from the north-eastern extensions of the Blue Ridge, in dark brown crystals as large as linseed or peas. The Brazilian monazite is already fine enough to be dissolved by strong sulphuric acid; but the Carolina variety has generally to be ground.

Monazite is a cerium phosphate—PO_4(Ce, La, Di)$_3$—in which part of the cerium is replaced by other cerium earths. Thorium is probably not a true constituent of the mineral, though it is usually mixed with the monazite in widely varying proportions. The Bahia monazite mostly brought to Germany does not contain more than 2 or 6 per cent. of thoria, but has from 50 to 60 per cent. or more of cerium earths; half of the latter being ceria itself. Brazilian monazite has generally 60 to 70 per cent. of cerium earths, 0·5 to 1·5 per cent. of thorium earths, and notable quantities of terbium and ytterbium oxides. The average results of four analyses by Hussak and Reitniger of a monazite from Bandeira de Mello are given in the subjoined table (marked I.); also the figures obtained by the same analysis from a sample from Bandeirinha in Minas-Geraes (marked II.).

	I. Per Cent.		II. Per Cent.
P_2O_5	25·51	..	29·18
Ce_2O_3	32·14	..	32·46
Nd_2O_3	15·38	..	16·81
$(La, Pr)_2O_3$	10·61	..	19·21
ThO_2	10·05	..	1·09
Fe_2O_3	1·79	..	0·61
CaO	0·20	..	0·10
ZrO_3	0·60	..	—
Al_2O_3	0·84	..	—
SiO_2	2·63	..	—
H_2O	0·92	..	—
	100·59 (*sic*)	..	99·46

In any case, the composition of monazite, or monazite sand, is highly complex; and the value of the mineral depends entirely upon the amount of thorium in it. The present demand for thorium salts causes very large quantities of monazite to be worked up; and no employment has yet been found for the bulk of the cerium nitrate incidentally obtained.

According to the author, the Brazilian monazite sands were first exploited by Mr. John Gordon, a member of the firm of E. Johnston, Son, and Co., of London and Rio de Janeiro. He supplied the Welsbach factory at Atzersdorf and other refiners, so that it came to be believed that he held a monopoly for the exportation of the mineral. After a time, there arose five other large factories for the treatment of monazite—viz., De Haen, of Hanover; Knöfler and Co., of Berlin; Kuhnheim, of Berlin; Schuchard, of Hamburg; and Görlitz and Sthamer, of Hamburg. In the United States, the Welsbach Company prepared thorium and cerium salts, using Carolina monazite, as the tax of $125 per ton more than compensated for the extra expense of treating the mineral. The idea of the Viennese Welsbach Company to monopolize the monazite sand business, says Dr. Böhm, led to the formation, in (about) April, 1902, of a German "ring" called "The

German Thorium Company," whose aim was to maintain prices, and to effect an agreement with Gordon, binding him only to supply its members at a price of $30 per ton for monazite containing 5 per cent. of thorium oxide. The first result of the ring was to raise the price of thorium nitrate by about 1 mark per kilogramme. It is doubtful whether any other chemical product has shown such variations in price as thorium nitrate. In 1894, it was quoted at 1900 or 2000 marks per kilo. By the end of 1895, it had fallen to 300 marks; and it continued to fall, until in 1899 it was quoted at 30 marks. Afterwards it rose again in 1903 and the first half of 1904 to 43 marks; rising further during the second half of 1904 and 1905 to 53 marks. In January, 1906, the price fell again to 27 marks per kilo.

Only a portion of the Brazilian coast where the bulk of the sand comes from belongs to Gordon; the greater part is the property of the Provinces of Bahia and Espirito Santo. Gordon has only the right to remove the sand. In 1903, the Central Government of the United States of Brazil discovered an old law to the effect that the right of removing sand could not be vested in private persons nor in the Local Governments, but in itself alone, and forbade Gordon to take any more. It then invited tenders for the removal of monazite from the south coast of Espirito Santo, and gave the contract to a German named Schnitzpahn, who let his rights lapse. In the summer of 1903, when an agent of the South Metropolitan Gas Company was in treaty with the Government in Rio de Janeiro, new tenders were invited; the firm of A. C. de Freytas and Co. being the highest bidders. This firm offered the Brazilian Government 50 per cent. of the receipts from the monazite sand, provided the amount exported should be at least 1700 tons. Thus it was the relationship between Gordon and the German Thorium Company was jeopardized; and ultimately a three-part agreement between them and De Freytas was concluded. The annual demand for sand containing 5 per cent. of thorium oxide was put at 1200 to 1500 tons, half of which was to be supplied by each exporter. The exporters bound themselves to supply only members of the Company; the price for 5 per cent. sand being 750 marks per ton. Above this they were each to receive one-third of the net profit on the thorium nitrate; the cost of manufactured nitrate being taken at 27 marks per kilo. Hence, at the recent selling price of 53 marks (overlooking the usual 7 per cent. discount), the profit should be 26 marks; one-third of it going to the Thorium Company, one-third to Gordon, and the other third to De Freytas. It must not be thought, however, that this sum of 9 marks per kilo. is the only profit obtained by the makers of thorium nitrate, for the total costs of 1 kilo. of nitrate made from 5 per cent. sand rarely exceed 17 or 19 marks.

This agreement caused the price of nitrate to rise from 43 to 53 marks, brought an increased amount of attention upon the production of thorium from old mantles, and doubled the value of the latter articles. Energetic attempts were also made to get "free" monazite. A French company opened two factories in the interior of Brazil, producing some 500 or 600 tons annually, deliveries from which are on the way to Europe; while certain of the smaller German manufacturers obtained possession of land in Carolina. Hence the German Thorium Company are threatened with danger. Besides the German firms, the American Welsbach Light Company and the National Light and Thorium Company are at work in Carolina winning sand outside the convention. The South Metropolitan Gas Company recently paid about $45,000 for a piece of ground near Shelby, which was investigated and rejected by German and American concerns.

According to Day, the amount of monazite won in the United States during the year 1900 was 412,232 kilos.; and its value was 204,981 marks. In 1901, the output fell to 339,926 kilos.; but the value rose to 248,900 marks. According to Dieseldorff, the amount of sand exported from Brazil was 1500 tons in 1901, 1500 tons in 1902, and 2000 tons in 1903; the quantity exported from the States in the last year being 400 or 500 tons. He considers the world's consumption of monazite sand to be about 2000 tons per annum, and the demand for thorium nitrate about 150,000 kilogrammes.

Gordon and De Freytas always hold large quantities of sand in Hamburg; the stocks being equal to about two years' requirements. The contract with the Thorium Company terminates in 1907; and it is not likely to be renewed, as the Company are already experiencing much difficulty in selling thorium nitrate at the price agreed upon.

The Mechanical Engineering of Collieries.—In the "JOURNAL" for the 21st of February last year, we noticed the issue, by the "Colliery Guardian" Company, Limited, of the first volume of an entirely new work on the above subject specially written for their paper by Mr. T. Campbell Futers. It comprised the first section, consisting of four chapters, dealing with boring, shaft sinking, surface arrangements, and shaft and head gears. We have now received from the Company the second volume, the whole of which is devoted to the important subject of "Winding." The text occupies about 280 quarto pages, and is profusely illustrated by diagrams and plates. As was remarked when noticing the first volume, the book is a timely addition to the literature of coal mining, in view of the stress laid by the Royal Commission upon the necessity for employing the most perfect machinery and appliances in the production of coal, in order to enable England to compete with foreign countries.

A FRENCH GAS-WASHER.

Towards the close of last year, the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, of Paris, took out a patent for a gas-washer. The specification appeared in a recent number of "Le Gaz;" and from it the following particulars have been taken.

The apparatus has been designed to bring together a liquid and a gas, and to create a sufficiently large contact-surface to effect complete reaction of one upon the other. The operation may have for its object washing gas to free it from one of its components, such as ammonia; condensing a vapour by a cold liquid; the evaporation of a warm liquid; the saturation of a liquid by a gas, with the view of obtaining a concentrated solution; and, finally, the reaction of a gas upon a liquid. The feature of interest in connection with the washer lies in the fact that the reciprocal movement of the two fluids may be produced by the motion of the washing mechanism itself.

The arrangement of the washer will be understood from the following diagrams.

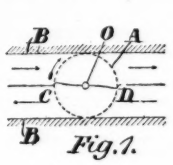


Fig. 1.

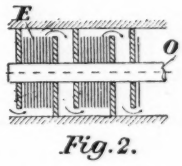


Fig. 2.

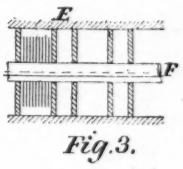


Fig. 3.

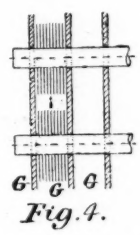


Fig. 4.

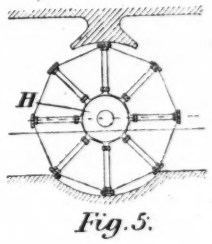


Fig. 5.

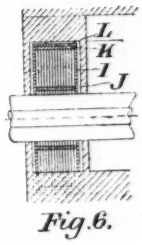


Fig. 6.

The apparatus shown in fig. 1 consists of a cylinder A, constructed of perforated sheet iron, revolving upon a shaft O in a channel B, which it fits exactly. The cylinder is filled with inert material intended to form a considerable contact-surface. The channel is half filled with liquid, and the rest of the space is occupied by the gas to be treated. If the cylinder is turned in the direction of the arrow, there is produced at C and D an alteration in the level of the liquid, which has the effect of sending some of it into C, followed by a corresponding inlet of gas, and the entrance of liquid into D in proportion to the quantity of gas expelled. The result is a displacement of the liquid from right to left, and of the gas from left to right. The upper part of the cylinder presents a considerable contact-surface between the two fluids—one moistening the inert material, and the other filling the intervals.

Figs. 2 and 3 represent a plan and an elevation of an apparatus based upon the principle just laid down. It consists essentially of a shaft O, to which are fixed plates E of metal, glass, or any other inert matter, according to the use to which the machine is to be put. These plates take the place of the material contained in the cylinder in fig. 1. They lend themselves to a better utilization of the available space, by presenting greater contact-surfaces in proportion to the room occupied. In fig. 3, the line F represents the separation-surface of the gas and liquid. The plates E are joined together in groups, which revolve in the chambers A, limited right and left by partitions arranged zigzag, and communicating with each other by pipes. In this way, the different groups of plates are mounted in series upon the same shaft; and if the two fluids are allowed to keep up the movement imparted to them by the friction of the plates, they displace each other in opposite directions, and the washing process is carried on methodically. The quantity and movement of the two fluids may be regulated as desired.

Another arrangement is shown in fig. 4. It consists in employing several plate-bearing shafts, and forming parallel channels G in such a way that each group of plates is traversed by a liquid coming from the corresponding group on the neighbouring shaft. Thus on each shaft there are plates parallel to each other, and working in series with those on the other shafts. Another apparatus of this kind is shown in fig. 5. There the shaft is surrounded by cement in the space H, to secure it, if needful, from being acted on by the gas under treatment, but removable for ordinary working. The shaft traverses a series of partitions which limit the different chambers, as shown in figs. 3 and 4. One of these is represented in fig. 6. The shaft carries at each end a metal plate I, serving for the support of the rods J K L going from one to the other. The rods J K are provided with notches, in which rest plates of glass or other material, maintained (with a certain amount of play) in any desired position.

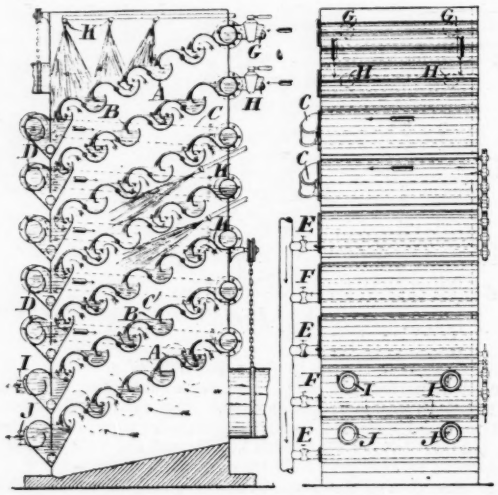
The appliance described operates in the general canalization, which is sufficiently large to allow a man to get to it easily for

cleaning, as well as for changing the plates. The different parallel conduits which are carried by the same shaft are separated one from the other by a channel communicating with them by holes which allow of clearing. The lateral walls of the channels are provided with man-holes and sight-holes through which the working and condition of the appliance can be inspected.

REGISTER OF PATENTS.

Gas-Purifying Apparatus. — Drees, M., of Aplerbeck, Germany. No. 1288; Jan. 23, 1905.

Appliances as hitherto used for "the mutual, direct reaction of gases and liquids" are based for the most part, says the patentee, upon the arrangement in series of liquid seals, through which the gases are positively obliged to pass; but the penetration of a number of such liquid seals one after another renders it necessary to exert a correspondingly high suction or pressure action upon the gases. In accordance with the present invention, however, the liquid seals are arranged side by side and in groups, which are intended to be traversed by the gas in a parallel stream—thus "ensuring very vigorous contact of the gas with the liquid, and, consequently, a very far-reaching interaction between the two, without necessitating an accumulation of the separate resistances to such a point that the counter-pressure becomes excessive."



As shown, the overflow channels A are themselves horizontal, and at the same time serve as reservoir and as immersion wall of the liquid seal to be formed, in such a manner that projections or prolongations B of the upper channels invariably extend below the lower seal level. A step-like channel plane of this kind, provided with liquid, therefore, forms "a resistance or liquid seal of an absolutely definite cross section, and of either predetermined or adjustable resistance," inside a shaft-like casing; and such groups of Venetian blind or shutter-like seals are said to secure "most efficient penetration of the two media, until a definite total resistance, which should be the highest permissible resistance, is attained." In order to obtain with this arrangement a single stream of liquid from group to group, the arrangement in series may be effected in numerous ways.

As shown, the channels are arranged in parallel, one beneath the other—being connected with transfer or circulation pipes C, outside the casing, and which, for the purpose of causing as little loss of head as possible, are given the smallest permissible inclination. With this arrangement it is possible to insert a number of such positive stepwise channel paths for the liquid, one within the other.

At places where the serpentine path which is given in all arrangements for the descending liquid is reversed, a collector reservoir D is provided—formed as a separator for the tar and other solid deposits from the liquid. By means of the cocks E and blow-outs F, it is possible to withdraw the solid or liquid substances as and when desired.

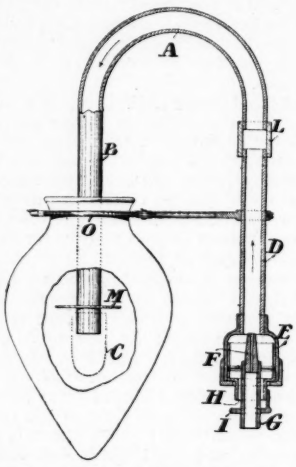
The separator is inserted at a point not placed in constant movement by the passage of the gas—"the separation is therefore largely facilitated owing to the relative tranquillity of the liquid." The gas penetrates only the liquid seals arranged inside the casing in series without having to pass through the separator outside. The liquid passes through the cocks G and H into the channel, fills the liquid seals, and flows, cascade fashion, over the front rounded lip or edge of the channels, serving as the overflow from channel to channel, so that its velocity is again retarded. It then passes through the separator D, is re-conducted to the other side, and, after the path described has been traversed the desired number of times, issues at I and J. A free descent or head of the liquid is therefore "obviated, or, at least, greatly restricted."

If the gas is to be permeated by the liquid in the form of a spray, there may be arranged within the spaces delimited by the stepwise series of channels spraying nozzles K or similar spraying or atomizing means. Further, the channels themselves may be adjusted by pivots in such manner that, without detriment to the principal characteristic action, a portion of the liquid may fall over the inner edge of the seal and thus cause a spraying action. It is also possible to adjust the channels in such a manner that no immersion of the gases takes place, but only a passage over succeeding surfaces and "a spraying owing to the cascade-like overflow from channel to channel."

Inverted Incandescent Gas Burners and Lamps.—Beins, J. F., and Vis, J. P., of Rotterdam. No. 1320; Jan. 23, 1905.

This invention has for its object more particularly the formation of "a constantly quiet and steady blue flame closely conforming to the shape of the incandescent mantle and effecting as complete combustion as possible in all its parts."

The burner is so constructed that the supply of air to be mixed with the gas may be very finely regulated in accordance with the pressure at which the gas enters the burner. The gas and air—after very intimate mixing and in a highly-heated condition — are "conducted to the flame practically without any excess pressure; and the heat of the products of combustion is utilized for heating the gas and air mixture and the mantle without any tendency to, or opportunity for, the formation of lamp-black."



The mixing-tube A is in the form of an inverted U, with branches of equal length. The descending "burner branch" B opens without restriction of cross section into the mantle C; while the ascending branch, or "supply branch," D, opens at its lower part into a wide, open chamber E, which encloses the upwardly-directed gas-nozzle F, which is supplied with gas through the pipe G. An annular space H is left between the neck of the chamber E and the gas-supply pipe G, through which atmospheric air enters the chamber in order to mix in the tube D with the gas entering from the nozzle F.

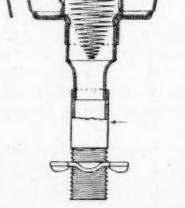
In order to regulate this supply of air in accordance with requirements, a metal disc I is mounted on the gas supply-pipe in such a manner as to be displaceable along its longitudinal axis by a fine screw.

The two branches B and D do not constitute a continuous tube; the lower branch being separated from the rest of the mixing-tube at the bend, but connected therewith by a socket or sleeve L of porcelain or metal, so that there is no continuity of substance between the two branches. Upon the burner branch, a short distance above the edge of the mantle, a thin metal disc M is fixed, of larger diameter than the mantle.

The patentees claim as their invention: An inverted burner for incandescent gas lighting, the mixing-tube of which is bent in the form of a U, the branches of which are downwardly directed and so proportioned relatively to each other that the branch opening into the incandescent mantle is at least as long as the other branch—its length being greater according as the normal gas pressure is higher. Also in an inverted gas-burner the combination with the mixing-tube claimed of a thin metal plate adapted to become quickly bright red—arranged a short distance above the mantle and having a larger diameter than the mantle.

Inverted Incandescent Gas-Burners.—Camelinat, E. G., of Birmingham. No. 2735; Feb. 10, 1905.

This invention in connection with inverted incandescent gas-lamps has for its object to provide such burners with means which will prevent the lighting-back of the flame from the burner-head to the gas-nipple on the lamp being lit, by locating an open-coiled spring within the interior of the burner-tube or injector-tube, at a point between the burner-head and the inlets for gas and atmospheric air.



The injection-tube is formed with a chamber or enlargement, or with an internal shoulder or other means for supporting the back-lighting prevention device, which consists of an open coil of wire, either of spiral or conoidal form, or of a flat volute-coiled form. This coil or wire spiral is dropped into the inside of the tube, and is supported by its outer edges resting on the internal shoulder or stop, and if of conoidal or spiral form, it is arranged with the apex of the cone pointing downwards, or presented towards the burner-head.

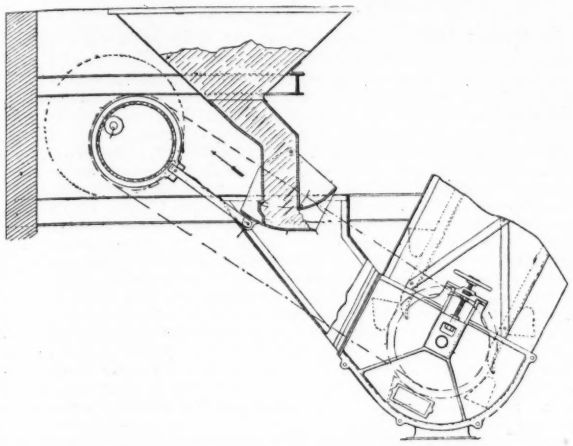
The back-flash coil may be fixed inside the tube, or else left loose to facilitate detachment; and instead of being supported by its edges resting against an internal shoulder or abutment, it may be carried by a hanging wire or other means from the walls of the burner-tube, or from a cross piece or bridge arranged across the bore or the tube.

Feeding Coal to Elevators and Conveyors.—Gibbons, W. P., and Reed, E. A., of Dudley. No. 4265; March 1, 1905.

This invention of "improved means for feeding coal and other material to elevators and conveyors" is particularly applicable to apparatus of the "bucket" type, controlling or regulating the feed of the material to the elevators or conveyors, and thus preventing them becoming choked and ensuring the material feeding properly into the buckets.

As shown (p. 433), an outlet shoot is provided (of rectangular or other suitable shape in cross section) at the bottom of the hopper containing the coal, and which passes through the shoot by gravity, by being fed by a spiral conveyor, or by other means. The shoot is arranged at a convenient distance for discharging into the buckets of

the conveyor or elevator. The lower or discharging end of the shoot is by preference made to extend somewhat lower at the back than at the front. Embracing the shoot is a swinging sleeve, which has two sides between which the shoot is situated and which are jointed to the shoot at a point preferably some distance above the bottom of it. The bottom of the swinging sleeve is by preference curved to form an arc of a circle of which the joint of the sleeve is the centre; and it extends a convenient distance in front and at the back of the bottom of the spout. This curved bottom of the sleeve is arranged to just clear the lower back part of the spout. At a convenient distance above the curved bottom of the sleeve there is a curved plate or shutter, carried by the sleeve and also forming an arc of a circle of which the joint of

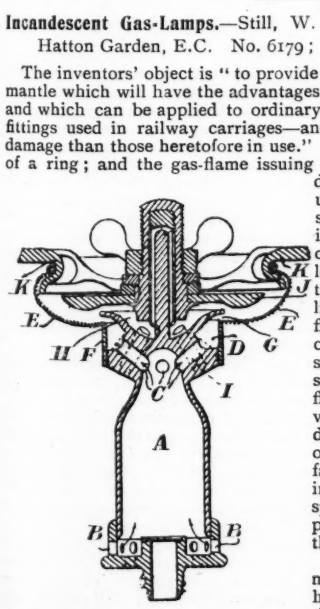


the sleeve is in the centre; and this is made to just clear and move below the front of the shoot. When the swinging sleeve is moved to its forward position, the coal falls down the shoot on to the bottom of the sleeve and there rests, because the front of this bottom part extends for some distance in front of the shoot. When the sleeve is moved backwards, the upper curved plate moves across the bottom of the shoot and cuts off the supply of coal from it; and at the same time as the curved bottom of the sleeve moves backwards past the lower back part of the shoot, the coal resting on it is by the rear portion of the shoot discharged, and falls into the buckets of the elevator or conveyor. Then, when the sleeve is moved in the opposite direction, the outlet shoot is by the upper curved plate uncovered, and the lower curved plate or bottom of the sleeve moves underneath the outlet and receives the material which issues from the spout ready to be discharged at the next backward movement of the sleeve. Thus, as the sleeve is rocked to-and-fro, measured quantities of the coal are intermittently discharged into the buckets of the conveyor or elevator, or into a shoot leading to it.

When the invention is used with a bucket conveyor of the kind in which series of buckets are suspended between two travelling chains made with side rollers which run along guides, it is preferred to operate the swinging sleeve by means of a sprocket wheel or the like, which is operated by the passing rollers of the conveyor so as to make the discharge movements of the swing sleeve synchronize with the positions of the buckets as they come along.

Incandescent Gas-Lamps.—Still, W. M., and Adamson, A. G., of Hatton Garden, E.C. No. 6179; March 23, 1905.

The inventors' object is "to provide an arrangement of burner and mantle which will have the advantages of those of the inverted type and which can be applied to ordinary fittings—more particularly the fittings used in railway carriages—and which will be less liable to damage than those heretofore in use." The mantle is made in the form of a ring; and the gas-flame issuing from the burner is spread by a deflecting plate so as to impinge upon, or sweep over, the upper surface of the mantle and render it incandescent—the products of combustion or flame being allowed to escape without passing through the mantle. The ring-like mantle may be more or less flat or be somewhat saucer or cup shape — the deflector or spreader being shaped to correspond, "so as to compel the flame to render practically the whole of the mantle incandescent." Preferably, a current of air is caused to flow over the face of the deflector, by providing an upwardly extending atmospheric burner with a central air passage which terminates below the deflector.



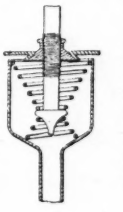
The burner nipple is surmounted by a mixing-chamber A, having lateral air-inlets B near the nipple. Through the top wall of the chamber are a number of small upwardly and outwardly directed apertures C, through which the mixed gas and air pass into an annular chamber D, the open end of which projects through the central opening in a suitably supported ring-like mantle E. To form the annular chamber D, the head of the mixing-chamber is enlarged and made with an external recess; and a ring F is adjustably screwed to it so as to enable the annular outlet passage G to be regulated. To ensure an even distribution of the gas issuing from this outlet, a groove connects the apertures C, and over the groove a sheet of gauze or finely perforated metal is held in place by the ring F. The central space or passage H within the chamber D communicates at its lower end with the atmosphere through upwardly and inwardly directed holes I, also formed in the top wall of the mixing-chamber.

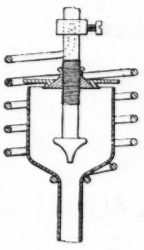
The deflector J, which is removable, is placed centrally over the flame, so that it is spread out in a more or less disc-like shape; and the mantle, which has its outer edge attached to an asbestos, steatite, metal, or other ring-like support K, is so arranged and of such shape that it will have its inner surface parallel with the underside of the flame—the flame or the products of combustion passing through the apertures in the support and not through the mantle. By these means a much greater surface is said to be rendered properly incandescent with a given consumption of gas than is the case with a mantle of ordinary shape.

The arrangement of burner and mantle described tends, the patentees remark, to increase the life of the mantle, as the force of the air and gas current will not be directed against the body of the mantle but will skim its upper or inner surface—the tendency of the current above the mantle being rather to draw away from it. This, however, is prevented by the deflector; for whatever form of mantle be used, the deflector has a corresponding shape, and the flame follows it.

Incandescent Gas-Burners. — Young, B., of Wandsworth, S.W. No. 7042; April 3, 1905.

This invention consists in suspending the mixing-cone and burner-tube carrying the mantle, or either, from the gas-nozzle and remainder of the burner or supply pipe, or other convenient support, by a spring or springs in such a manner that the burner-tube and mantle are free to move in all directions relatively to the gas-nozzle, and thus practically no vibrations are transmitted to the mantle. Regulation of air to the mixing-cone is effected by a freely-mounted plate resting on a nut or adjustable collar on the gas-nozzle or on the supply pipe; while adjustment of the mantle is effected by adapting the mantle-holder to screw up or down on the burner-tube.





In carrying out the invention according to the mode shown, the burner-tube and mixing-cone are in one. The gas-nozzle is inserted in the open end of the mixing-cone, and the latter is connected to the former or to the supply pipe by a spiral spring, wound in a double conical manner, having a narrow waist at about the centre of the mixing-cone and connected at the top and bottom of the latter. The gas-nozzle may be inserted in the middle of the spring and be connected at about the narrow waist by projecting pins, so that only a spring resistance will be offered to movements of the cone relatively to the nozzle in all directions. If desired, the burner-tube or mixing-cone may be connected by springs to other parts of the burner—for instance, to the globe gallery or to the arms supporting the same; or a perforated or other plate may surround the burner-tube over the globe and be connected by springs to the gallery arms by adjustable screws.

In another form, one end of a spring may be connected to a collar screwed on the gas-nozzle or on the gas-supply pipe above the mixing-cone, the spring passing in convolutions around the latter and being secured at its other end to the cone or to the burner-tube. The tension of the spring can be adjusted by screwing the collar up or down. Several springs may be used in this way if desired.

The open end of the mixing-cone is covered more or less by a plate freely resting on a nut screwed on the gas-nozzle or supply pipe or on a collar adjustably screwed on it, as by a set screw. Thus the plate may be set to any desired position above the cone to permit the inlet of the necessary quantity of air; and when once set, the plate may be moved up or to one side or the other, but will always fall back to its initial position.

Band or Belt Conveyors.—Gibbons, W. P., and Reed, E. A., of Dudley, No. 5340; March 14, 1905.

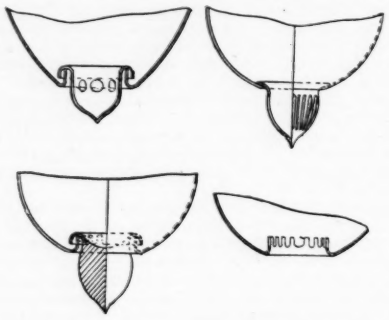
This invention has reference to conveyors in which the material is carried by an endless travelling band or belt, which passes round a drum or pulley at either end—one of the drums or pulleys being made to revolve so as to cause the band or belt conveyor to travel, and with it the material placed on it. As usually constructed, idlers or idle rollers are placed under both the upper and the lower portion of the belt at such intervals apart as the weight of the band and the material to be conveyed may require; and hitherto the spindles for the idle rollers have been carried by brackets placed on supports usually transverse to the path of the band, and the position of these brackets is not afterwards capable of easy movement or adjustment. The principal object of the invention is to provide means whereby the spindles for the rollers can be more readily fixed, and, after fixing, can readily be adjusted—the means for carrying the idle rollers also serving, in some cases, as the structure for carrying the band or belt conveyor.

Globes and Draught Screens for Inverted Mantles.—Helps, G., of Nuneaton. No. 7517; April 10, 1905.

The patentee proposes to insert a glass or other baffle contrivance in the air-orifice of the globe, having ways so formed in it that the air for combustion, before it reaches the mantle, is "caused to travel in more or less broken streams, and by which means it is heated before it reaches the mantle and its force is reduced."

The invention may (see p. 434) take several forms. One form is that

where a pear-shaped globe is used, the lower portion of the globe being open and having an upturned serrated or twisted edge into which a screen may be fitted, also with serrated edges, and taking on the outside just that shape which the globe would have taken if it were made in one piece. Another form is where the lower portion of a round globe has a circular hole in it, and a specially shaped glass or porcelain



screen is fitted therein. The screen, which will pass through the large hole in the upper portion of the globe, will not pass out of the lower hole entirely but project a certain distance—resting on its flanges or edges. The portion which projects from the globe has holes arranged around or in it for the ingress of air. Another form is where a disc with serrated or twisted edges, which allow air to enter between it and the globe, is used, and which rests on a suitable bed in the globe itself, or is provided with projections to keep it in position.

APPLICATIONS FOR LETTERS PATENT.

1585.—Younger, T. B., "Gas-condenser." Jan. 22.
1595.—Beal, W., "Incandescent burners." Jan. 22.
1598.—Gill, E., "Street-lamps." Jan. 22.
1609.—Johnson, A. F. J., "Acetylene-generators." Jan. 22.
1642.—Armstrong, J., "Coke and gas manufacture." Jan. 22.
1734.—Temperley, J. R. & J., and Alexander, W., "Hoisting appliances." Jan. 23.
1751.—Tourtel, J. M., "Coin-freed mechanism." Jan. 23.
1790.—Twigg, W. W., and Watson, J., H., "Burners." Jan. 24.
1824.—Helps, J. W., and Lemmon, N. G., "Inverted incandescent burners." Jan. 24.
1828.—Tooth, L. F., "Gas-lamps." Jan. 24.
1841.—Schatz, E., "Analyzing gas." Jan. 24.
1848.—Steinicke, G., "Inverted lamps." Jan. 24.
1859.—Poleschowsky, J., "Gas-burners." Jan. 24.
1977.—Wilson, L., Gas-turbines." Jan. 26.
1980.—Morton, G. L., "Producer-gas plants." Jan. 26.
1992.—Nehmer, H., "Lighting gas." Jan. 26.
2009.—Park, C. A., "Inverted lamps." Jan. 26.
2021.—Parker, S., and Jeffreys, C., "Preventing robberies from automatic gas-meters." Jan. 26.
2025.—Griffin, C., "Gas-engines." Jan. 26.
2040.—Derval, E., "Vertical retorts." Jan. 26.
2058.—Imray, O., "Inverted gas-lamps." A communication from Julius Pintsch. Jan. 26.
2080.—Schwarzhupt, A., "An alarm for gas installations." Jan. 26.
2104.—Carter, J., "Anti-vibrating apparatus for gas-mains." Jan. 27.
2119.—Mundler, S., "Inverted burners." Jan. 27.
2136.—Dunphy, A. L., "Balanced ram-heads." Jan. 29.
2213.—Goodwin, A., "Suction gas-producers." Jan. 29.
2245.—Hoering, P., and Wielandt, W., "Gasifying raw combustible materials." Jan. 29.
2262.—Ehmann, C. P., "Inverted burners." Jan. 30.
2320.—Wiederhold, O., "Incandescent lamps." Jan 30.
2350.—Dussert, C., "Incandescent burners." Jan. 30.
2351.—Dussert, C., "High-pressure gas." Jan. 30.
2368.—Tully, C. B., and Shadbolt, R. G., "Manufacture of gas." Jan. 30.
2369.—Price, C. W., and Spreadbury, E. L., "Incandescent gas-lamps." Jan. 30.
2376.—Warburton, W., "Inverted gas-lights." Jan. 31.
2406.—Crossley, W. J., and Atkinson, J., "Internal combustion engines." Jan. 31.
2498.—Milne, J. B., "Gas manufacture." Feb. 1.
2502.—Crossley, W. J., and Webb, W., "Internal combustion engines." Feb. 1.
2515.—Hart, W. J., "Gas-stove and kitchener combined." Feb. 1.
2533.—Kinsey, H., Challenger, G., and Nott, J. H., "Generating acetylene." Feb. 1.
2551.—Chevalier, E. A., "Generating acetylene gas." Feb. 1.
2568.—Lockerbie and Wilkinson, Ltd., and Brand, J. C., "High-pressure acetylene-generators." Feb. 2.
2618.—Cowan, T. W., "Gas-lamps." Feb. 2.
2634.—Hawker, A. B., "Incandescent burners." Feb. 2.
2642.—Hooton, R., "Gas-retorts." Feb. 3.
2644.—Bannerman, A., and Kay, A., "Gas-heater for kitchen range boilers." Feb. 3.
2708.—Tcherniac, J., "Manufacture of sulphocyanides." Feb. 3.

The Spalding Rural District Council have decided not to oppose the South Lincolnshire Water Bill; but the Bourne Urban District Council are still undecided as to what they will adopt.

LEGAL INTELLIGENCE.

COURT OF SESSION—SECOND DIVISION.

(*Before the* Lord Justice-Clerk, *Lord* Kyllachy, *and Lord* Stormonth-Darling.)

Tuesday, Feb. 6.

J. Muir and Son, Limited, v. Edinburgh and Leith Gas Commissioners. The Pollution of a Brewery Well.

To-day the hearing was begun of the Reclaiming Note for the defenders in the action by James Muir and Son, Limited, of Calton Hill Brewery, Edinburgh, against the Edinburgh and Leith Gas Commissioners. The pursuers sued for £10,000 damages for the alleged pollution of their Stable Well by tarry products, which were said to have proceeded from the gas-works in New Street, at which the manufacture of gas was discontinued in April, 1904. In the early part of July, the carburetted water-gas plant was dismantled and taken away; and towards the end of July the well was observed to be polluted. The pursuers maintained that the pollution was caused through the carelessness of the defenders in the process of emptying the tar-tanks forming part of the carburetted water-gas plant. This was denied by the defenders, who said that they exercised every care and precaution in handling the contents of the tanks, and that the pollution complained of had no connection with their operations. In the Outer House, Lord Ardwall heard evidence for five days last summer; and on June 29 he gave his decision, to the effect that the defenders had allowed coal-gas tar and water-gas tar to escape from their premises and to find their way into the underground water which flows down to the pursuers' property, leading to the serious pollution of the water in the well. He gave decree for £3730 damages, and found pursuers were entitled to expenses.*

The defenders and reclaimers were represented by the Lord Advocate (Mr. T. Shaw, K.C.) and Mr. J. Duncan Millar, instructed by Mr. J. M'G. Jack, the Clerk to the Gas Commissioners. The pursuers and respondents were represented by Mr. Guthrie, K.C., and Mr. Constable, instructed by Messrs. Finlay and Wilson.

Mr. Millar, in opening the case for the reclaimers, explained that originally there were conclusions for penalties under the Gas-Works Clauses Act; but these had been departed from, and their Lordships were now dealing purely with the question of whether there was liability for damages at common law, from the alleged pollution.

Lord Stormonth-Darling asked if the opinion of Lord Ardwall was correctly printed, because he said, in one place: "No oil-gas tar was ever manufactured there." Then, farther down, he said: "Practically, it may be taken that the polluting substance in the pursuers' well was either water-gas tar or oil-gas tar."

Mr. Millar said the Lord Ordinary found that the defenders must have caused the pollution, but that it did not matter very much what it was. It was the pursuers' case that the pollution was caused by water-gas tar, and all the evidence was directed to that; and probably the Lord Ordinary had adopted the view that it was water-gas tar, though he took the wider view that there had been pollution, and that it was not necessary for him to go into what the pollution was. The Lord Ordinary had only reached his judgment by eliminating one of the articles from the record; and he said that the defenders had suffered no prejudice through there not being sufficient disclosure of the case. Upon the evidence, he (Counsel) disputed this entirely. The defenders' witnesses only had a specific case presented to them. They did not make a general investigation. To have done so would have involved the sinking of bores and the making of a great many inquiries all over the district, as to the source of pollution. The first attack he made upon the Lord Ordinary's judgment was that he had held that the specific case made by the pursuers on record had been entirely disproved by the evidence; but then he had gone on to hold that there was sufficient in the averments to make a general case of pollution. If the averment as to the escape of water-gas tar were eliminated, all the other averments were meaningless. The Lord Ordinary's theory was that the overflow from the separator tank had, during the eight years that carburetted water gas was being made, found its way through the drain into the High Well in the defenders' works; that there sedimentation had occurred; that the polluting material found its way to the bottom of the well, and accumulated there; and that when 400 gallons of water—not altogether pure water—was poured on the ground at the emptying of the separator tank, it flowed into the High Well, and forced out, at the bottom, the polluting material. No notice was given them of this wider case; and he submitted that the defenders were seriously prejudiced. The pursuers had failed to prove that the pollution was caused by the defenders' operations.

Lord Kyllachy: The Lord Ordinary finds that the well was polluted to a slight extent by coal-gas tar, and to some extent by water-gas tar; and that nobody else could have done it but you.

Lord Stormonth-Darling: And there is certainly this in favour of the Lord Ordinary's theory—that there was a remarkable coincidence in the matter, because this operation occurred exactly three weeks before the pollution was discovered. The Lord Ordinary must have been struck by the coincidence; and he had hit upon his theory. It was only a theory; but really the judgment was founded upon the fact that the pollution was there, wherever it had come from.

Mr. Millar contended that the evidence on the merits of the case was not consistent with the Lord Ordinary's suggestion. The outcrop of the sandstone reached the surface before it got the length of the High Well; and therefore no pollution from the High Well could have found its way into the Stable Well. As to the suggestion that the head of water could have forced the polluting material through the strata, he asked their Lordships to look at the pursuers' plan.

The Lord Justice-Clerk: If a line were taken parallel with the

* "Journal," Vol. LXXXIX., p. 717; Vol. XC., p. 728; Vol. XCI., p. 52.

surface of the ground, from the bottom of the High Well, where would it strike the Stable Well?

Mr. MILLAR said it would be 25 feet below the bottom of the Stable Well, and 50 feet below where the pollution came into the Stable Well. There was no evidence that the pollution of the Stable Well occurred lower down than 183 feet from the surface—in fact, it was the other way. The Lord Ordinary's theory was really not founded upon proved facts at all. Before the Lord Ordinary's judgment could be held to be well founded, it would be necessary to prove a case of pollution beyond the shadow of a doubt. If a case of general pollution were made out, there were several answers to it. The first question raised in reference to pollution was when the pursuers found that there was a very strong smell of gas proceeding, not from their own well, but from a public drain which ran close alongside, in Calton Road. Then there were no complaints about pollution from the works during the eighty years in which gas was made there, nor during the period in which carburetted water gas was manufactured. There had been complaints of the pollution of another brewery well; and on that occasion the pollution was traced to the North-British Railway Company's men pumping gas liquor out of the gasholder tanks at the mouth of the Calton tunnel. This brought him to the most important question in the case—viz., whether the pursuers had proved that the pollution was by water-gas tar. It was admitted that there was the greatest difficulty in distinguishing between oil-gas tar and water-gas tar. It had not been proved, he submitted, that water-gas tar existed in the pursuers' well. Three distinctions were made. The first was as to the coke; the second was as to the existence of nitrogen; and the third was the specific gravity. The specific gravity was the only test upon which the witnesses relied; but this was not at all reliable. It was generally assumed that water-gas tar had a higher specific gravity than oil-gas tar; but sometimes it was found to be the other way. Upon the question of the amount of damages, he submitted that a new water supply could be obtained at a cost of between £700 and £800; and the sum awarded, if their Lordships should come to consider the amount of damages, should be very materially reduced. He asked their Lordships to reverse the decision, and to give the defenders absolvitor, or, alternatively, to dismiss the action. In any event, the defenders had confined their efforts to the case which was made against them; and, this being so, he contended that they were entitled to the expenses they had incurred in meeting the case.

Wednesday, Feb. 7.

Mr. CONSTABLE said he took it that there was a well-established difference between what was necessary to constitute a relevant averment in an action of damages arising out of an ordinary act of negligence, and one which arose out of a nuisance, or a process of manufacture which had been created by the defenders. In the former case they must prove a certain effect and a certain cause, and the particular manner in which the cause had taken effect. On the other hand, in a case where negligence was presumed, all that they required to do was to set forth the effect, and to state that it had been produced by a given cause, without it being necessary to show the particular way in which the cause had taken effect. In the present case the question was whether, in an action which was *de facto* founded on a nuisance, the pursuers were to be deprived of their remedy because they had gone on the plan of specifying methods of working which, he assumed, they had failed to prove. He maintained that the pursuers' record, as it stood, raised not only a particular act of negligence, but also a general cause of action, founded upon the escape of a dangerous substance from the premises of the defenders, which would entitle them to a remedy apart from any specific act of negligence being proved. They averred the dismantling process and the pollution of the well, which were quite sufficient specifications of an effect. He thought the proof had shown that it was possible to establish a case without going into the particular manner in which the pollution had taken place. Whatever was the reading of his friends at the first, they had ample notice during the proof that the particular case was not the only case before the Court; but that there was also the general case. If they had taken up the same attitude at the proof which they did now, they should have asked for absolvitor then. The reason why that was not done was obvious, because, if they looked at the evidence, they would see that the defenders did their very best to meet the general case which the pursuers presented. As to the polluting material, they had shown, by an extensive series of experiments numbering about nineteen, that in every case the water-gas tar was slightly heavier; and the conclusion pointed to was that the pollution was the result of contamination by water-gas tar. Another point was the exclusion of other sources of pollution. It seemed to him the proof was complete upon the point of exclusion. There was a network of drains in the gas-works, which nobody seemed to know anything about. There was a drain which came from, and went to, nobody knew where. A sample was taken from this drain; and it proved to be of the same nature as the substance found in the pursuers' well. This was important, as showing that there was a general distribution, throughout the gas-works, of contamination of this kind. The case was clearly proved, partly affirmatively by probabilities which, cumulatively, rose to a certainty, and partly by excluding other sources from which pollution could have come. As to the question of damages, the Lord Ordinary's findings rested upon the consideration that well water—which was naturally hardened water—was essential to the production of "Edinburgh Pale Ale." For the last few years the Stable Well had been the pursuers' main source of water supply for brewing, partly because it yielded a good deal more than the other brewery well, and partly because it was found to be more satisfactory. The amount awarded was a very moderate one. As to the sinking of a fresh well, it would be a chance whether they would strike new water. There would be the chance of their coming upon the same pollution. The result of cementing the sides of the Stable Well might be that the polluting material would rise till it polluted the other well. As to costs, the expense of the expert evidence upon the dismantling was exceedingly small. Of all the witnesses brought by the pursuers, only one spoke to this; and of the defenders' expenses, it was also a trivial proportion. He had no doubt that under ordinary rules, the Auditor of the Court would do all that was necessary in regard to such a matter; he was bound to tax off any expenses which were caused by any part of the proof in which he might think that the pursuers had been unsuccessful.

The LORD ADVOCATE said that when the Lord Ordinary closed the proof he indicated to the parties that the case was not proved; and he had no doubt that he would decide the case in this view. But he did not. The matter had, substantially, been decided mainly upon one or two grounds. One was that the well was polluted. This, however, was not the matter in dispute; it was the wrongful and negligent actings of the defenders. The question of the proximity of the works was one which had lasted for eighty years, during which time they had been managed without complaint; and then, months after the works were closed, the defenders were confronted with this claim for pollution. The defenders naturally looked with anxiety to see what was alleged against them. Their Lordships would not find in the record any general challenge. Read aright, the records meant to say that the defenders did all their operations properly, except that one of spilling water upon the ground.

The LORD JUSTICE-CLERK: If the statement had been that the pollution arose by reason of negligence in the emptying of the tank, that would not have been consistent with the accumulation of polluting material in the High Well long before; but might it not be consistent with the Lord Ordinary's view that it served to flush the pollution which existed? In that view, should you not have asked the pursuers to amend their record?

The LORD ADVOCATE: That would depend upon what happened in the course of the procedure.

Lord KYLLACHY: In that view, absolvitor from the action as laid would not prevent another action being brought, and the same evidence being led.

The LORD ADVOCATE assented. He said dismissal would be sufficient. He did not ask a judgment which would preclude the raising of a fresh action. Continuing, he said that, besides the case on record, there was what he might call the Lord Ordinary's case—the High Well case. The Lord Ordinary did not hold the High Well case to be proved; he only made a surmise with reference to it. The depth of the High Well, which was substantially a gathering pot or receptacle for all water, was only 42 feet. The depth of the Stable Well was 207 feet. From the bottom of the High Well to the bottom of the Stable Well there was a fall of 165 feet. The pollution occurred, and only occurred, 183 feet from the surface; so that the fall from the bottom of the High Well to the polluting point was 140 feet. But from the 183 feet point, the outcrop of the strata would, at the High Well, be high up in the air, above the mouth of the well. A great deal had been made by the Lord Ordinary, and by some of the witnesses, of the fact that 400 gallons of water were poured upon the ground. The Lord Ordinary seemed to think that this amount would give hydraulic power; but 400 gallons would only be a cube of 4 feet. All that happened in this act would have happened in a heavy shower of rain. The High Well was 21 feet in diameter; and a cube of 4 feet would only raise the level of the water in the well by about a foot. But there was a third case—the general case of pollution. The strength of the general case lay in the two elements—the proximity of the pollution, and the nature of the polluting material. As to the latter, the evidence showed that it was not a single substance which had been traced. The thing which was said to have polluted was, alternatively, coal-gas tar and water-gas tar. If they took coal-gas tar, it was right that their Lordships should know that it was a marketable commodity. If one barrel of coal-gas tar were to burst at any part within a large area, it was certain that this would cause pollution. If they had been able to say it was water-gas tar, and nothing but that, it would have been possible to state that nobody produced it except the defenders. He entirely demurred to the Lord Ordinary's view that everything had been exhausted. Indeed, it had not. This, he thought, disposed of the general, as well as of the special case. As to the damages, the Lord Ordinary had given a most extravagant award; and with regard to the costs, the defenders should be found entitled to them.

Thursday, Feb. 8.

Mr. GUTHRIE submitted that the Lord Ordinary had taken the right view of the case, upon the four points which were brought under his notice: First, as to whether, on the record, there was merely a special case; secondly, apart from the condition of the record, whether they had proved the pollution of the well by material from the defenders' works; thirdly, as to the damages; and, fourthly, as to expenses. It was said that the pursuers pinned themselves down to one mode in which the polluting material had escaped.

Lord KYLLACHY: That you put them off their guard?

Mr. GUTHRIE: Quite so. But it was to be observed that the summons was not impugned. Coming to the pleas, it must be admitted that the Lord Ordinary at first took a view of the case unfavourable to the pursuers; but when the law was stated to him, he saw the matter in a different light. He thought the Lord Ordinary had come to the conclusion that, taking it as a whole, whatever difficulties might arise as to one or more single sentences, the defenders got notice sufficient to raise the general case that there was a certain product which they manufactured, from which the pursuers had suffered serious loss and damage, by its being allowed to escape. He admitted that, if he could not make good the general case, he could not maintain the special case on record.

Lord KYLLACHY: You would like to consider whether you should not amend the record, even now?

Mr. GUTHRIE: Yes; I would propose now to be allowed to consider the question of amendment, with a view to taking an amendment, and moving that it be allowed.

The LORD JUSTICE-CLERK (after consultation with his brethren) said that it seemed to be most convenient that, having heard the other side fully, the debate should go on to a conclusion. Of course, they would not decide the case until the question of amendment was settled.

Mr. GUTHRIE then proceeded to argue that the Lord Ordinary had decided the general case in pursuers' favour; and it was arranged that an amendment should be prepared and submitted to the Court.

The Liabilities of Prepayment Consumers.

At Portsmouth, last Thursday, the Borough Magistrates had before them a suit instituted by the Portsea Island Gas Company against Henry Hunt, a hawker, under the following circumstances: A prepayment meter had been supplied to him, and though between Sept. 23 and Nov. 19 gas to the value of 7s. 8d. had been used, only 1s. 8d. was found by the Company's collector. The defendant alleged that the lock of the meter had been surreptitiously broken off, and the money stolen by someone; it being suggested that an entrance to the house had been effected while the door was open to allow the children to play outside. Notice was given at the Company's offices by the defendant at the time, and he also called in a constable and showed him the fractured lock. Placed upon his oath, the defendant stated that he had put the proper money into the slot, and had in no way whatever tampered with the lock. In the absence of evidence of a conclusive nature, the Bench dismissed the case.

Withdrawal of the Ilford Gas Company's Appeals.

The Ilford Gas Company having given notice of appeal in the two actions brought against them by the Mayor and Corporation of East Ham, and the Ocean Accident and Guarantee Corporation, Limited, respectively, in which the verdict and judgment were adverse, the appeals have several times appeared in the list for hearing. Last Wednesday, Mr. Sylvain Mayer applied to the Court, consisting of Lords Justices Vaughan Williams, Stirling, and Fletcher Moulton, for leave to withdraw the appeals. He said they had been allowed to stand over for some weeks, in order that the decision of the Official Referee on the question of damages might be obtained. Mr. Muir Mackenzie had now given his decision, awarding £150 in one case in which £10,000 was claimed, and in the other, where the claim was £7500, he awarded £120 (see *ante*, p. 299). The Directors of the Gas Company, seeing that the litigation, if pursued further, could only end in the House of Lords, considered it better, under the circumstances, to withdraw the appeal in each case. Lord Justice Vaughan Williams asked what was said by the other side. Mr. Richards, on behalf of the East Ham Corporation, said he had no objection to the appeal being withdrawn; his costs being provided for. His Lordship said it would have to be treated as an abandoned appeal, and it would be for the Taxing Master to say what were the proper costs. It must not be assumed that, because the appeal had been abandoned, the costs would be the same as if it had been argued. Mr. Richards said he was aware of that. Briefs had not been delivered or anything of that sort. Mr. Mayer remarked that his clients gave notice ten days ago that the appeals would not be proceeded with.

Thefts from Prepayment Meters in South London.

Before the Croydon Borough Bench, on the 26th ult., Francis Attwell, George Baker, and John Potter, boys of 14 and 16 years of age, were charged with stealing from a prepayment gas-meter at No. 92, Harrington Road, South Norwood (an unoccupied shop), 7s. 4d., the property of the South Suburban Gas Company. George Baker, Alfred Potter, and Henry Potter, youths, were charged with stealing from a gas-meter at No. 25, Farley Road (an unoccupied house), 6s., and Charles Ingrams and George Baker were also charged with stealing from a prepayment gas-meter in an unoccupied shop at No. 78, Portland Road, 8s., also the property of the Company. When arrested Henry Potter said that all he knew about the matter was that they had shared out 2s. 5d., while Attwell said the charge was quite right. John Potter said Baker broke the window of the house in Harrington Road while Attwell kept watch outside. George Baker told Detective Cadby that this was not the only house they had broken into. Alfred Potter and Henry Potter and himself went to several houses, from one of which they got 6s. 6d.; Alfred Potter keeping watch outside while they robbed the gas-meter. Frank Clark, one of the Company's inspectors, spoke to finding the meters broken open, the indices showing that the amounts named had been abstracted. In the case of Ingrams and George Baker, Detective Cadby said that, when he arrested Ingrams, he volunteered to show him how they got into the shop, and went on to say that they had "done" about eleven, getting 8s. from the shop in the Portland Road. Baker broke the window, got through, and let him in the back door. Baker afterwards broke open the meter, and they then went to London and spent the money. There were previous convictions against Baker, about whom, it was stated, the police had received many complaints. The Bench bound Ingrams, John and Henry Potter, and Attwell over, under the First Offenders' Act, to be of good behaviour for the next six months, and sentenced George Baker to three months' hard labour. Alfred Potter was discharged. Before the Court rose, the Bench recalled Baker and withdrew their sentence—remanding him for a week with the view of his being sent to a training-ship, he having expressed a desire to go to sea. At the Greenwich Police Court, several youths were, a few days ago, charged with stealing money from prepayment meters. Some were remanded, and one, who pleaded guilty, was bound to come up for judgment if called upon.

Southwell Gaslight and Coke Company, Limited.—At a meeting of the shareholders of this Company held last Tuesday at Nottingham, presided over by Mr. H. J. Schumach, a resolution for voluntary liquidation was passed. The Chairman explained that the concern having been purchased by Messrs. Derbyshire Bros., of Nottingham, it was necessary to wind up, in order that the proceeds of the sale might be duly distributed. Mr. E. A. Browne, of the firm named, was appointed Liquidator. The concern, it is of interest to note, is one of the oldest in Nottinghamshire—having supplied gas to Southwell for upwards of half-a-century. It is also noteworthy that Mr. John Kirkland, one of the original shareholders of the Company, was appointed Secretary shortly after its formation; and despite advanced age, he has actively continued his duties up to the present time.

MISCELLANEOUS NEWS.

READING AND THE SULPHUR QUESTION.

A Special Meeting of the Reading Town Council was held on Thursday. The Mayor (Mr. E. Jackson) presided; 28 of the 40 members being present.

The Town Clerk pointed out that the meeting had been called for the purpose of considering, and if deemed expedient passing, a resolution in the following terms: "That this Council do now resolve to oppose in the next ensuing session of Parliament a Bill which has been deposited in Parliament, and of which the title is as follows: 'A Bill to remove the restrictions in respect of sulphur compounds (other than sulphuretted hydrogen) now imposed upon certain gas companies;' and that the costs and expenses incurred or to be incurred by the Council in opposing the Bill be charged upon the borough fund and borough rate of this borough."

Mr. Brinn said he had received a circular from the Engineer of the Reading Gas Company, and supposed that to a certain extent, it had been written from the Company's point of view. He should, therefore, ask whether their Medical Officer of Health (Dr. Ashby) had seen one, and what he had to say upon it, because it might influence some of the members.

Mr. Venner asked that Dr. Ashby's report of Dec. 14 should be read to the Council, and said he should like to know the probable cost of opposing the Bill, and also to have some references made to the report of the Departmental Committee on Gas Testing.

Mr. Parfitt said he supposed there was no reason to doubt the statement that only a small percentage of gas undertakings were subject to this restriction.

Alderman Ridley said he was one of those who would like to have a little information on the subject. He received a rather thick number of a gas publication from the office of the Gas Company; but it did not contain any argument, and was simply a frantic appeal that the Corporation should not oppose the Bill.

The Town Clerk reminded the Council that a conference of the Local Authorities affected by the Bill was called at the instance of the Council, and recently held in London. Alderman Martin, who was in the chair at the conference, was in possession of the minutes.

Alderman Martin (Chairman of the Finance and General Purposes Committee), replying to Mr. Brinn, said he, in common with that gentleman, received the circular referred to. Knowing that it came from the Gas Company, who were interested in it, he would probably read it with a grain of salt—at any rate, with a disinterested mind. He (Alderman Martin) had also received another extract from the "Journal of Gas Lighting;" and through the courtesy of the Gas Engineer, he had had a copy of the Blue-Book issued by the Departmental Committee, which contained enough literature to last him a twelvemonth. He had certainly read some of the evidence; but he did not intend to give an exposition on this highly technical question. He then moved the resolution read by the Town Clerk. He said it would be within the recollection of the Council that their Medical Officer of Health, who was also Public Analyst for Reading, gave the Council the following report upon it:—

> The evidence which has been given as to the effect of burning coal gas containing much sulphur in houses, is conflicting; but I think it is undesirable that gas should be permitted to contain an unrestricted quantity of sulphur, especially as gas undertakings are now doing all they can to push the use of gas as fuel for heating and for cooking stoves with penny-in-the-slot meters, which are generally placed in small houses in very improper situations, with no means of exit for the products of combustion. Sulphur acids arising from the combustion of fuel are among the most objectionable constituents of fogs; so that if, as is anticipated, gas is to be much more generally used as fuel for heating and cooking in future, I am of opinion that the sulphur in it should be reduced to the lowest practicable quantity. At present, a much larger proportion of those acids in the atmosphere is derived from the combustion of coal and coke, but it will be lessened as the use of gas fuel becomes more general. Indeed, it is being strongly urged that the most promising solution of the smoke abatement difficulty lies in that direction.

In consequence of this report, the Town Clerk, himself, and one other gentleman—who could not go—were deputed to attend a conference of those authorities who would be affected by the Bill. He believed there were 720 gas undertakings in England, of which 487 belonged to companies and 233 to local authorities. Of all these, he was told that only 50 had any sulphur restrictions—Reading being one. Therefore they would be directly hit by the Bill, if there was anything in it. He did not know; he was not an expert, and did not profess to be, on this question. Therefore it was thought desirable that those comparatively few authorities who were really interested in the question of sulphur restriction should attend a conference in London. He went with the Town Clerk; and they put him (Alderman Martin) in the chair, as representing Reading. The ten authorities delegates were from East Molesey, Hampton, Harrow-on-the-Hill, Hastings, Ipswich, Reading, Richmond (Surrey), Shrewsbury, Teddington, and Wolverhampton. There were about thirty or forty gentlemen present. At the conference, these resolutions were passed: "That this conference recommends to its constituent authorities that the 'Gas Companies (Removal of Sulphur Restrictions) Bill, 1906,' be opposed in the public interest." "That this conference recommends its constituent authorities to present a joint petition or petitions against the Bill." "That Mr. Harry G. Pritchard be asked to act as Secretary to the conference." "That, in the event of a petition or petitions being presented against the Bill, Messrs. Sharpe and Co. be recommended to take charge thereof." As to the merits of the case, he had endeavoured to read the evidence on both sides; but it was most conflicting. He was bound to say he was very much struck by the evidence of Dr. J. S. Haldane, F.R.S., who was of the opinion of Dr. Ashby in this matter. It was certainly a very interesting piece of evidence; but it was only fair to say that the Departmental Committee, which was appointed to

inquire into the matter, came to a conclusion in favour of removing the restrictions. It was, of course, a question for the Council to decide whether it was wise to join other corporations, or to petition alone against the Bill. He had no feeling whatever in the matter. Having expressed the opinion that the Gas Company's undertaking ought to have been acquired twenty years ago, he (Alderman Martin) said that possibly if it had been vested in the Corporation they, instead of being called upon to oppose the Bill, might have said: "Perhaps in our own interest it is best not to oppose it." (Laughter.) If the Council thought they should go farther in opposing the Bill, it was necessary for at least 21 members to vote for the resolution before it could be carried. As to what the cost would be, he had not the slightest notion; but no doubt the Town Clerk would be able to give them some idea.

Alderman ENERBY formally seconded the proposition.

Alderman FIELD read to the Council a portion of the report of the Departmental Committee, in the course of which they said that, after careful consideration of the evidence submitted to them on this question, they were of opinion that the requirement that the sulphur impurities should be removed to such an extent as to demand the use of lime, should be discontinued. This, he said, was quite sufficient to make them hesitate before incurring very great expense in opposing the Bill. What was good for London was good for Reading. What they wanted was that some means should be discovered for purifying gas other than by lime, which he had known for some considerable time was an unmitigated nuisance when the work was going on. He should welcome uniformity in the testing of gas; but until they had that, he did not see why they should single themselves out with some dozen corporations and oppose the Bill.

Dr. ASHBY was then asked his opinion on the statement issued by the Company. He replied that there was considerable evidence on the other side which was not given there.

Mr. BRINN: Suppose there was a very large excess of sulphur, what would be the effect?

Dr. ASHBY replied that he thought it would cause unpleasantness and perhaps discomfort, and, in the case of certain susceptible persons, it would tend to act injuriously. There was no direct evidence of actual injury to health from it; but there was a good deal to show that leather and furniture were very much acted upon by acids through burning gas containing much sulphur. Then, again, it was now the policy of gas companies to push the use of cooking-stoves in small houses; and they were placed in most improper positions where, as a rule, there was no exit for the products of combustion, which all went into the house. It was therefore exceedingly bad in small houses; and when this was going on, it was not the time to think of dispensing with sulphur restrictions. If they were to be done away with, he thought no gas-stove ought to be allowed to be fixed unless under a proper chimney.

Mr. BONNY said he should support the resolution to oppose the Bill. He did not think that, in the capacity of a Corporation, they ought to look at it from the point of view of a Gas Company. Alderman Martin had said that if they were the owners of the gas undertaking they would not oppose the Bill.

Alderman MARTIN: I said possibly.

Mr. BONNY said he could not imagine it possible at all. It was their duty to look first of all to the health of the town. There was no question that the sulphur products in gas must be more or less injurious to health. ("No.") Certainly, they were not conducive to comfort. The small room in which he spent a good portion of the day used to be almost unbearable when he had gas, because he breathed these sulphur products.

Mr. COLEBROOK: That was not the sulphur products.

Mr. BONNY: Probably a small percentage—not sufficient for a prosecution. The room got very stuffy.

Alderman FIELD: That is not sulphur.

Mr. BRINN also supported the resolution. With regard to the statement by the Departmental Committee that lime was the only means of taking out sulphur, and that it was a very objectionable process, he thought if they did away with these clauses there could not be any inducement to find a better means of removing the sulphur. If they remained, some men of science might find that the sulphur could be taken out by other means than lime.

Mr. VENNER, while supporting the resolution, agreed that the nuisance caused by the stench during the process of purifying gas by means of lime was abominable. But in looking through the report of the Departmental Committee, he felt they could not go behind evidence of such a strong character as that of Professor Haldane, supported as it was by their own Medical Officer of Health. Dr. Ashby practically backed up the professional evidence in the report; and he (Mr. Venner) thought the Council would seriously consider, for the sake of the public health of the town, before allowing the gas companies, who were interested, to push this Bill through Parliament without opposition. He should like to have heard the probable cost of opposing the Bill; but he felt that, let the cost be even something considerable, they would be studying not one section of the public, but the whole of the town. They had been told by certain medical men who had made a life study of the subject, of the serious effect of sulphur upon leather, paintings, and pictures. What must it be upon the health of the public generally? It was true that if the Bill went through Parliament they would do away with one nuisance. They were told, however, that though it was a nuisance, and produced a bad feeling on people who were inclined to be weak in the stomach, it was nevertheless not injurious to health; and he would rather put up with a nuisance of this description, which was not injurious to health, than have a nuisance which they could not detect, and did not know the evil result arising from it.

Mr. W. M. COLEBROOK remarked that there were 720 English gas undertakings, and 670 of them were satisfied to carry on their business—he referred more especially to those which were municipally managed—without these sulphur clauses. To his mind, this was a very strong argument indeed. Why should they in Reading, because they happened to have a very old Act of Parliament which gave them the power, set themselves up as an authority? What was good for 670 undertakings was certainly good enough for Reading. The London County Council were up-to-date in these matters; and if sulphur in gas was so injurious as Mr. Venner tried to make them believe, it was not likely that the Council would have taken the line they had done. He objected to the one-sided way in which Mr. Venner had dealt with the Departmental Committee's report. The Committee were in favour of withdrawing the sulphur clauses—at any rate, so far as the London County Council were concerned. He (Mr. Colebrook) was quite sure that if the two things were weighed together, the inconvenience and nuisance arising during the purifying process was a very much more serious matter than the infinitesimal amount of sulphur left in the gas. He was not a shareholder in any lighting company; but, on behalf of the ratepayers, he protested against the utterly useless waste of money which opposition to the Bill would entail. It was absolutely unnecessary and unwarrantable.

Dr. G. STEWART ABRAM remarked that what they had to consider was whether there would be any great disadvantage to the inhabitants of the town by not opposing the abolition of these clauses, and whether there would be any great advantage to the Gas Company by so doing. The Company would not get any great financial advantage, because it cost them only about £300 to carry on purification by lime. In regard to the other side of the question, he did not think that most of the gentlemen who had spoken had in the slightest degree recognized how very infinitesimal would be the increase in the amount of sulphur, presuming these restrictions were withdrawn. With regard to any harm which might be done to people by an excess of sulphur, of course, they had to remember that they had suffered during the past few years excessive inconvenience from the smells which had gone on during the purification process by lime. There was an argument used in the report of the Departmental Committee that the purification process was dangerous to the workmen. He believed it was very slight indeed. Nor did the inhabitants suffer in health from the smells. Therefore he did not oppose the resolution either on the question of harm to the workmen or the inhabitants; the only reason why he should feel inclined to oppose the resolution would be because he could not see that they were going to get any great advantage out of it, nor were they helping the Gas Company in any unrighteous desire to gain something. The Company would not gain anything, and the Corporation would not gain anything. What was necessary was to try to get a really uniform, definite, and compulsory system of analysis.

The TOWN CLERK said if they wanted to get that they must oppose the Bill; then they would be in a position to approach the other side. It did not follow that they need carry their opposition very far. They could have a conference with the Company, who might be willing to meet them. He could not say what the expense of opposing the Bill would be, because he did not know whether the constituent authorities to the conference would present a joint petition or whether each one would bear the expense of its own individual petition.

Alderman OWEN RIDLEY remarked that, like Dr. Abram, he came there with an open mind. Mr. Colebrook said that the only reason they had this protection was because they were under an old Act. But if this were so, let them stick to it, and not give it away. He had had passed over to him by Alderman Martin a letter, which was read, from Mr. T. P. Blunt, Public Analyst for Shropshire, Montgomeryshire, Merionethshire, and the Borough of Wenlock, and who, he should think, was a man whose opinion was worth reading. Mr. Blunt said:

> I am of opinion that any attempt by the gas companies to obtain a removal of the restrictions as regards the quantity of sulphur, ought to meet with uncompromising opposition in the public interest. Whatever danger is done by the burning of gas is due almost entirely to the sulphur it contains; sulphurous and sulphuric acid (or oil of vitriol) are formed by its combustion, and tend to discharge the colour and destroy the texture of pictures or fabrics submitted to their action. Sulphurous acid (the suffocating fumes produced from burning sulphur) is injurious to the health of those breathing it; and this is true also of vitriolic fumes. It is clear, therefore, that if any action is taken by Parliament, it should be rather in the direction of further restriction than of greater laxity in the limit of sulphur in gas to be used as a domestic illuminant or source of heat.

It seemed to him (Alderman Ridley) the Company had a nuisance on their works in trying to get rid of this sulphur, and that they proposed to get rid of the nuisance by transferring it into the houses of their customers. He did not think this was really a good way for a large monopolist company to discharge their duty.

Mr. F. B. PARFITT said he was certainly very greatly impressed by the fact that there were only about fifty undertakings throughout the whole country that had these restrictive clauses in operation. It seemed to him that, if the great dangers and difficulties to the public caused by an excess of sulphur were as alleged, there might have been obtained overwhelming evidence throughout the whole country of the deleterious effect caused to those districts where the clauses were not in operation. Generally speaking, it did seem to him that there had been no case made out for the Council entering on the expensive opposition; and he should certainly vote against the resolution. He was only concerned in the public interest and the public health; and if, as he was satisfied, it was not going to suffer by the removal of these restrictions, he did feel that there would be a great boon to the town in the abolition of the unmitigated nuisance of the smells, which were worse than any sewage farm.

Mr. E. P. COLLIER said his point was this—if it came to a doubt, give the public the benefit. Because they were one of fifty towns having a special privilege, he did not see why they should give that privilege away.

Mr. MOSDELL stated that he should support the resolution, simply because he thought that if the gas was less pure, it would be a very serious thing for the people who had stoves.

The MAYOR said he came there with a perfectly open mind; and he had intended not to vote. But he thought from what he had heard that he should vote for the resolution.

Alderman MARTIN having replied,

The resolution was put to the meeting; but only 19 voted for it. Four members could not vote, and five abstained.

The MAYOR, who did not put the alternative, declared the resolution not carried; only 19 having voted for it, whereas it required 21.

Mr. BONNY: Can the Council bring this matter up again by notice of motion?

The TOWN CLERK: The time for opposition would have expired.

SHREWSBURY GAS COMPANY.

Their Bill Approved.

A Special Meeting of the Shrewsbury Gas Company was held last Saturday week to consider the Bill which is being promoted with the object of removing the sulphur restrictions at present imposed upon the Company. The Chairman (Mr. J. S. Phillips) presided, and fully explained the reason for the application to Parliament and the real facts bearing on the sulphur question. He said that if the Bill became law, the Company would take just as much, if not more, care to furnish the purest gas possible, because it was very obviously in their interest to supply the best article, so as to ensure giving every satisfaction to the consumers. They might ask, possibly, if they were going to do this, what necessity was there for promoting a Bill? The answer was that the elusive qualities of sulphur compounds were so deceptive, and perfect purification was so difficult, owing to sudden changes of the atmosphere, that, with the greatest possible care, on some occasions they could not help over-stepping the limit prescribed by their Act. As a matter of fact, once or twice they had exceeded the limit; but it so happened that the gas examiner did not take a test at the time. He hoped he had shown that such restrictions were absolutely unnecessary; and the only reason for their asking to be relieved of them was that, if through no fault of their own they happened to exceed the limit, they were then liable to vexatious prosecution, which he thought was very unfair. He might add that the lime they had to use to effect the purification was a far greater nuisance to the neighbourhood than was any possible amount of sulphur which could get into the gas. Those were their reasons, and he thought that they were sufficient ones, for promoting the Bill.

Turning to other matters, the Chairman remarked that as it was impossible for him to be in Shrewsbury at the time of the general meeting of the Company, he would like to make one or two observations with regard to the position of the business. They had had an excessively mild winter—unprecedentedly mild he should call it; for even the preceding week the minimum temperature two or three nights was higher than in the month of June—and nothing affected the consumption of gas so much as the temperature in the winter. But notwithstanding this, there had been a very substantial increase in their consumption. He attributed this principally to three things. First, the largely increasing use of slot meters among the smaller consumers. Secondly, the much more general introduction of gas-stoves for cooking. They were economical, they were clean, and they were much more easily managed than a coal-fire. As a proof of how far superior a gas-stove was to a coal-fire for cooking, he might mention that nearly every London club, and all the great restaurants in London, cooked almost entirely by gas. Thirdly, there was the fact of the excellence of the incandescent burner. This gave a far better light than electricity at a very much smaller cost. The public, he thought, were beginning to thoroughly appreciate these three factors. Since July 1, they had been able to give their consumers the benefit of a reduction of 1d. in the price of gas; and though he did not like to prophesy, or hold out any hopes that were not likely to be fulfilled, he trusted that at the end of their financial year they would be able to give a corresponding advantage to their shareholders by an increase of a further ¼ per cent. in the dividend.

A resolution approving of the Bill was carried unanimously.

CHELTENHAM GAS COMPANY'S BILL.

The Sulphur Restrictions.

At a Meeting of the Cheltenham Town Council last week, Alderman Norman proposed that a petition should be presented against the Bill which the Gas Company are promoting, for (among other things) the repeal of the sulphur restrictions and the reduction of the illuminating power of the gas from 15 to 14 candles. After explaining that no further step than the negotiation which would follow upon the lodging of the petition would take place without the sanction of the Council, he contended that they ought not to give up what they gained when the last of the Company's Bills was before Parliament—viz., the raising of the minimum candle power from 14 to 15, and the reduction of the sulphur impurities from 30 to 25 grains per 100 cubic feet—without being advised by an expert that they would suffer no disadvantage therefrom. The suggestion that the Company should be allowed to reduce the illuminating power of the gas because they wanted consumers to use mantles, was also very like telling a teetotaller who complained of his water supply that it would be very good if he mixed it with whisky. The Corporation should not only resist these proposals on the part of the Company, but should insist on the Company being prevented from turning their impurities into the sewers, should require a clause ensuring that when the streets were broken up for gas purposes the work should be done by the Corporation at the Company's expense, and should require an alteration of the system under which the Corporation, while paying the Company monthly for the gas consumed in the streets, received only the 5 per cent. discount which the smallest private consumer obtained on paying his accounts quarterly—the latter being a change which would make a difference of £150 or £200 a year to the ratepayers.

Mr. Ley Wood, in seconding the motion, pointed out that the effect of the clause for reducing the illuminating power of the gas would be that the private consumer would either have to go to the expense of purchasing mantles for his burners or would have to use a great deal more gas to obtain the present amount of light. Mr. Bennett urged that the Council should seize the opportunity to boom their own electric light. The motion was agreed to without opposition.

In the course of the proceedings, the Town Clerk put in a copy of a resolution passed by the Ratepayers' Association in favour of terms being made with the Gas Company, so as to avoid the expense that would have to be incurred in opposing their Bill.

THE SULPHUR CLAUSES IN NEWCASTLE & GATESHEAD.

Both the Newcastle City Council and the Gateshead Borough Council have resolved to oppose the Gas Companies (Removal of Sulphur Restrictions) Bill in the forthcoming session of Parliament. The Newcastle Watch Committee said they considered the removal of the restrictions would enable the Companies to use cheap sulphurous coals in the manufacture of gas, and pollute the gas supplied by them with an unlimited quantity of sulphur, which would result in serious injury to the health of the inhabitants and the destruction of property. The Newcastle and Gateshead Gas Company, however, pointed out that, of 720 gas undertakings, only 47 were subject to the sulphur restrictions; and when the matter was under consideration by the City Council, a letter was received from the Company's Solicitors stating that Durham gas coals were used, and that these could not fairly be described as "cheap sulphurous coals." Sir W. H. Stephenson, amid considerable interruption, claimed the right to speak, not as Chairman of the Company, but as a member of the Council and a large ratepayer. He said the allegation that the abolition of the sulphur restrictions would open the door to the use of inferior qualities of gas coals was entirely groundless. Even if the purification of the gas cost 1d. per 1000 cubic feet—which he did not admit—this would mean a saving of £12,000 a year; but of that the consumer would get £10,000, and the Company only £2000. Mr. Adams pointed to the injury that would be done to poor consumers using flat-flame burners if the restrictions were abolished. It was, he said, the business of the Council to safeguard the whole community; but there was a special obligation upon them to look after the interests of those who could not do so themselves—namely, the very poorest.

THE "STANDARD" ON LIME PURIFICATION.

The "Standard" last Thursday contained the following reference to purification: "A correspondent has written asking us for information with regard to the Bill which is being promoted this session by some of the gas companies 'to remove the restrictions in respect of sulphur compounds now imposed upon gas companies.' Our correspondent wants to know if this means that 'private residents living within 200 yards of gas-works are to be daily asphyxiated.' We are happy to be able to set our correspondent's mind at rest, by stating that the object of the Bill in question is to enable purifying by oxide of iron to be substituted for purifying by lime, generally known as 'blue billy.' The result will be that the characteristic smell pervading the neighbourhood of gas-works will disappear to such an extent that, according to our information, it will be very difficult to distinguish, by the olfactory organs, gas-works from any other manufactory."

THE CARDIFF GAS BILL.

The Council's Objections.

The Parliamentary Committee of the Cardiff City Council have approved of the petition which has been drafted by the Town Clerk against the Gas Company's Bill. It is argued that the proposal to extend the area of the Company's supply would render it more difficult for the Council at any time to acquire the undertaking, and that a similar objection applies to the desire of the Company to acquire the undertaking of the Taff's Well Gas and Water Company, Limited, and also because it is a Water as well as a Gas Company. The various proposals relating to the consolidation of capital are opposed on the ground that they tend to increase the market value of the Company's stock, and so to enhance the price which the Corporation would have to pay for the undertaking at any time. It is asserted that large sums of money have been spent by the Company out of revenue for various purposes (such as buildings), or placed to reserve or superannuation funds), which should have been placed as capital expenditure; and that by this method the reduction in the price of gas, which the Company would otherwise have been bound to make the consumers, has not been made. It is suggested that the statutory maximum price for gas should be reduced to a figure not exceeding the present price, and also that the charge for gas for public lighting should be fixed on a lower scale. The proposed reduction of the standard from 16 to 14 candle power is objected to, as it was on the occasion of the last Bill of the Company. Opposition is also taken to the proposed laying of double mains, and to the competition with the Electricity Department of the Council.

A proposition had been made by the Company that a conference should be arranged between the Directors and the Committee; and the Town Clerk gave it as his opinion that, now the petition had been approved, there was no reason to urge against such a meeting. It was agreed that the petition should be deposited, irrespective of whether the conference was arranged or not.

Supply of Water Gas in Dublin.—At a meeting of the Royal College of Science Chemical Association, in Dublin, last Saturday week, Mr. G. A. Watson read a paper on the "Manufacture of Coal Gas;" and in the course of it he said that he desired to correct a statement which had been made in a public lecture by Professor Roche. This gentleman had said that Dublin gas contained from 20 to 40 per cent. of carbon monoxide; whereas he (Mr. Watson) had found, on careful analysis conducted by himself, that it contained less than 12 per cent. of this poisonous constituent. An inspection was afterwards made of the works of the Alliance and Dublin Consumers' Gas Company, over which the visitors were conducted by Mr. Waterfield, one of the Company's Engineers.

SOUTH STAFFORDSHIRE MOND GAS COMPANY.

Annual Report.

In their report for the twelve months ending Dec. 31 last, the Directors of the South Staffordshire Mond Gas (Power and Heating) Company state that during the first half of the year the Power-Gas Corporation officials had control of the running of the works, in order to train the workmen and staff and to get the plant into working order. The distribution of gas to consumers commenced at the end of April; and since then gas has been continuously supplied. As the parliamentary powers bind the Company to give a constant supply, it is obvious that works of this magnitude must have a certain load-factor, below which the plant cannot be properly manipulated. To secure this load-factor, arrangements were entered into with the South Staffordshire Mines Drainage Commissioners to supply them with gas for firing the boilers at their pumping-stations, on condition that the Company can cut off or vary the supply at any time. Naturally, exceptional terms had to be given to secure these conditions. The experience of all large power-distributing companies—namely, that a considerable period elapses from the setting to work of the central station till any appreciable number of customers can be obtained and connected up—has been repeated by this Company. Intensified by the fact that this is the first attempt to distribute power and heating gas in quantity over a large area, there has not unnaturally been scepticism as to the practicability of the scheme, thus causing prospective customers to delay negotiating for the use of Mond gas till they were satisfied that they could rely on a constant supply at their respective works. In addition to these difficulties, which, since the manufacturers of the district have seen the plant at work without a single stoppage for more than eight months, have been overcome, a further obstacle has been the necessity of demonstrating practically the actual economies to be derived by using Mond gas in furnaces for different operations at local works. Furnaces working on a commercial scale have had to be erected at the works, and have been placed at the disposal of the different manufacturers, who have sent their own men and materials to carry out their tests. These furnaces are working satisfactorily; and manufacturers are now looking into the matter carefully with the view to their own special requirements. Two of the largest works in Walsall and Wolverhampton have recently been supplied with gas for power and heating; and the proprietors are so satisfied that they are extending its use. Other works and factories in Wolverhampton, Walsall, Wednesbury, Bilston, and Tipton, are also being supplied with gas, and the prospects of more rapidly extending the sales are decidedly improving. The negotiation of contracts for sales of gas, laying of branch-mains, making connections to customers' works, alterations of furnaces in such works, ordering of gas-engines, all obviously take time; and these and the before-mentioned causes, with the small proportion of gas disposed of at remunerative rates, and the heavy cost of getting into regular working order, explain why there is a debit balance of £8951 on revenue account. This amount the Board have decided to carry to a suspense account, to be dealt with hereafter. Recognizing the difficulties and expense to which the Company have been put in starting the undertaking, the Board have decided to forego their fees for the year.

The accounts accompanying the report consist of the usual statements. They show that the paid-up stock on the 31st of December amounted to £926,405; that £1,076,875 had been added on conversion, making £2,003,280; and that £222,445 remained unissued out of the total authorized (including premiums) of £2,235,000. The total amount borrowed on the above-named date was £339,062 10s., and £135,937 10s. was added on conversion; making a total of £475,000, and leaving £79,226 to be borrowed out of the £550,000 authorized. The receipts on capital account amount, with premiums, to £2,532,917 14s. 5d. The expenditure stands at £1,349,275 7s. 9d., with a nominal amount of £1,212,812 10s. added by conversion—together, £2,562,087 17s. 9d. There is consequently a balance of £29,170 3s. 4d. carried to the balance-sheet. The expenditure on capital account in the half year was £23,599, apportioned as follows: New and additional mains, services, &c., £3391; stoves, £7958; prepayment meters and fittings (less £5678 written off for depreciation), £12,250. The reserve fund amounted on the 31st of December to £32,543; and the insurance fund to £31,255. The following is the revenue account:—

Expenditure.

Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£82,890 10 6		
Salaries of Engineer and officers at works	1,948 18 0		
Wages (carbonizing)	18,581 11 11		
Purification—including £2408 19s. 6d. for labour	4,194 6 6		
Repair and maintenance of works and plant, materials, and labour, less £408 3s. 6d. received for old materials	30,689 13 10		
		£138,305 0 9	
Profit sharing		3,126 9 7	
Distribution of gas—			
Salaries and wages of officers and rental clerks	£3,237 13 0		
Repair, maintenance, and renewal of mains and services, material, and labour	5,564 12 0		
Repair and renewal of meters	2,801 11 0		
" " " " stoves	5,744 16 9		
" " " " prepayment meters and fittings	6,514 9 9		
Incandescent mantle maintenance, &c.	547 16 1		
		24,410 18 7	
Public lamps—lighting and repairing		2,872 16 0	
Rent, rates, and taxes		10,615 11 11	
Management—			
Directors' allowance	£1,250 0 0		
Company's Auditors	75 0 0		
Salaries of Secretary, Accountant, and clerks	1,128 5 8		
Collectors' salaries and commission	1,622 16 9		
Prepayment meter collection	1,564 7 1		
Stationery and printing	1,008 1 7		
General charges	1,245 0 11		
		7,893 12 0	
Bad debts		1,097 9 2	
Law and parliamentary charges		805 15 3	
Superannuations and allowances		1,076 15 2	
Official officers		139 5 7	
Total expenditure		£190,343 14 0	
Balance carried to net revenue account		61,030 1 2	
		£251,373 15 2	

Receipts.

Sale of gas—			
Common gas per meter at 2s. 5d. per 1000 cubic feet (70,530)	£180,767 5 8		
Public lighting and under contracts, common gas	6,881 2 11		
	£187,648 8 7		
Less discounts and allowances	3,019 12 0		
		£184,628 16 7	
Rental—			
Meters (24,426)	£2,883 3 7		
Stoves (38,337)	6,069 18 11		
Prepayment meters (45,224)	9,915 13 2		
Incandescent mantle maintenance	428 15 4		
		19,297 11 0	
Residual products—			
Coke, less £4762 1s. 5d. for labour	£27,201 2 7		
Breeze, less £621 10s. 5d. for labour	2,591 3 3		
Tar	6,952 16 7		
Ammoniacal liquor and sulphate of ammonia	10,622 12 8		
		47,367 15 1	
Miscellaneous receipts—			
Rent receivable	£46 10 0		
Transfer fees	33 2 6		
		79 12 6	
Total receipts		£251,373 15 2	

The following are the statements relating to the manufacturing operations of the Company in the half year:—

Statement of Coals and Oil.

Description.	In Store June 30, 1905.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store Dec. 31, 1905.
	Tons.	Tons. cwt.	Tons. cwt.	Tons. cwt.	Tons.
Common	31,813	104,397 5	112,408 15	722 10	23,079
Cannel	2,508	..	..	..	2,508
Total	34,321	104,397 5	112,408 15	722 10	25,587
Oil—gallons	510,502	822,299	1,065,556	..	267,245

Statement of Residual Products.

Description.	In Store June 30, 1905.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1905.
Coke—tons	2,822	68,850	15,275	49,514	6,883
Breeze—tons	180	12,395	..	12,270	305
Tar—gallons	73,376	1,192,087	..	1,052,318	513,145
Ammoniacal liquor—butts	8,622	31,784	32,218	..	8,188
Sulphate of ammonia—tons	184	1,059	..	1,098	145

Statement of Gas Made, Sold, &c.

Quantity Made (meter register and estimated).	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,664,850	41,875	1,499,641	1,567,010	4098

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coals, oil, &c., £19,141; coke and breeze, £3597; tar, ammoniacal liquor, sulphate of ammonia, &c., £7717; sundry stores, £26,476—total, £56,931. A sum of £12,938 stands in the balance-sheet as employees' bonus and savings.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report which the Directors of the above-named Company will present at the half-yearly general meeting of shareholders on Thursday.

The revenue account for the half year ended Dec. 31 shows a net profit of £61,030 1s. 2d., which, added to the balance of £16,239 18s. brought forward from last year, produces a net revenue balance of £77,269 19s. 2d. Deducting £8271 6s. 7d. for interest, there remains standing to the credit of the net revenue account a balance of £68,998 12s. 7d. available for dividend.

The Directors recommend the payment of dividends thereout at the rates of £5 4s. per cent. per annum on the 4 per cent. stock of the Company, and of £5 per cent. per annum on the 3½ per cent. stock, both less income-tax

The balance of the net revenue will be carried forward to the next half year.

Messrs. T. Bevan, F. Green, and H. E. Jones, three of the Directors, retire by rotation, and, being eligible, offer themselves for re-election.

Mr. H. W. Gell, one of the Auditors, will go out of office by rotation, and, being eligible, offers himself for re-election.

BRISTOL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Offices, Canons' Marsh, Bristol—Alderman J. W. S. Dix in the chair.

The Secretary (Mr. J. Phillips) having read the notice convening the meeting, the report of the Directors was presented. It opened with congratulations on the continued prosperity of the Company, as shown by the increasing demand for gas, and the fact that the profit for the six months ending Dec. 31 (£34,437), notwithstanding the recent large reduction in the price of gas, was more than sufficient to meet the dividend and interest. They recommended the declaration of a dividend at the rate of 5 per cent. per annum.

The Chairman, in moving the adoption of the report and accounts, said it was not his intention to make many remarks on them, as they were so clear and excellent; and he thought the Directors could congratulate themselves as well as the proprietors on the accounts they had been able to issue. It was not long since a reduction in the price of gas was made, and it was looked upon by some people as a very hazardous thing. The reduction had taken place, and he was happy to say that, after the experience of two half years, they had been able to pay the same dividend and carry forward a balance. The total number of meters in use in 1904 was 41,402, and at present it was 44,711, or an increase of 3309. Their prepayment meters in 1904 were 10,914, and at present 13,511—an increase of 2597. The cookers on hire were 26,889 in 1904, and now 30,327, or 3438 more. The miles of main laid in 1904 were 347½, compared with 350½ in 1905—an increase of 3¼ miles. The gas made was 2455 million cubic feet, compared with 2489 millions; being an increase of 34 millions. The public lamps in 1904 numbered 9023, and at present 9217—an increase of 194. The shareholders might rest satisfied that their interests would not be neglected; and he saw no reason why the present satisfactory condition of things should not continue.

The Deputy-Chairman (Mr. G. K. Stothert) seconded the motion; and it was carried unanimously.

Alderman Dix and Mr. Fenwick Richards having been re-elected Directors of the Company,

The Chairman, in returning thanks, remarked that the business had largely increased since he was elected Chairman sixteen years ago. He noted with satisfaction the increase in the prepayment meters, and he believed it would continue. He only regretted that they had not been able to get authority to charge less for gas used for motive power than that charged when it was employed for lighting. The Corporation were able to charge lower for electricity used for power purposes; and the next time the Company went to Parliament, he hoped they would be more successful on this point.

On the motion of the Chairman, seconded by Mr. Stothert, it was decided for the future to hold an annual meeting in February, and pay an interim dividend in August, instead of having two half-yearly meetings.

The dividend recommended was then declared, and a vote of thanks accorded to the officials; emphasis being laid on the splendid services rendered to the Company by the Secretary and the Engineer (Mr. D. Irving, M.Inst.C.E.). These compliments were fittingly acknowledged, and the proceedings closed.

The Progress of the Company.

Accompanying the Directors' report were some tabulated statistics showing the Company's progress during a period of 43 years. They were incidentally referred to by the Chairman when returning thanks on his re-election. The following are some of the figures:—

	1862.	1882.	1902.	1904.
Capital expenditure. . .	£255,388 ..	£697,110 ..	£1,158,814 ..	£1,263,047
Reserve fund .	15,287 ..	38,146 ..	106,470 ..	113,794
Coal carbonized, tons	47,910 ..	109,218 ..	239,650 ..	253,987
Gas made, c. ft.	389,000,000 ..	1,010,000,000 ..	2,285,000,000 ..	2,489,000,000
Day consumption, cub. ft.	— ..	— ..	904,000,000 ..	1,043,000,000
Price of gas .	3s. 9d. ..	2s. 10d. ..	2s. 3d. ..	2s.

The figures for the day consumption commence with 1892, when they were 435 million cubic feet. The Company began letting out prepayment meters in 1891; and in the following year there were 20 in use. Ten years later there were 6955; and last year, 13,511. Cookers were hired out for the first time in 1888. By 1892, there were 2196 in use; by 1902, there were 19,560; and last year there were 30,327. The public lamps in use have risen from 3308 in 1862 to 9217 last year.

PROVINCIAL GAS COMPANIES.

Good Business and High Carbonizing Results at Cambridge.

The half-yearly report presented at the recent meeting of the Cambridge Gas Company showed that the working in the six months ending Dec. 31 enabled the Directors to recommend the payment of a dividend at the maximum rate, for which a sum of £18,317 was available. Both retort-houses are now fully equipped with mechanical stoking apparatus; and the result of the carbonizing is giving entire satisfaction. The Chairman (Mr. E. H. Parker), in moving the adoption of the report, said he thought the Directors were justified in congratulating the shareholders on the continued prosperity of the Company, which had again made its maximum dividend, and something to spare. As a proof of their success, he mentioned that during the past half year there was an increase in the gas made of 5,350,000 cubic feet in comparison with the corresponding half of 1904. The following increases would also show how well the Company were doing—101 in ordinary consumers, and 29 in ordinary cookers. In heating-stoves there was an increase of 28, in slot meters an increase of 295, and in slot stoves of 264, which constituted a record. He thought this was extremely satisfactory, taking into consideration the bad times they had been passing through. It showed that the prepayment system was very flourishing and greatly appreciated in the town. The satisfactory results were, he thought, largely due to the able management of Mr. Auchterlonie, to the excellent way in which their accounts had been kept by their old and valued Accountant (Mr. Wheaton), and, indeed, to the staff generally. He wished to call attention to the good work of the carbonizing foreman. The quantity of gas made per ton of coal carbonized worked out at 11,081 cubic feet, which was an increase of 102 cubic feet extracted from each ton of raw material. A great deal of their prosperity was due to the excellent results of the carbonizing. The position of the Company was now such that the Directors were able to announce that, as from the 31st of March, the price of gas would be reduced by 2d. per 1000 cubic feet. The motion was carried; and the dividend recommended was declared. A special meeting was then held to consider the Bill for the removal of the sulphur restrictions. The Chairman read the preamble of the Bill, and stated that any saving there might be in the manufacture of gas would conduce to the benefit of the consumers, by enabling the Company to keep the price a little lower, though the abolition of the lime process might not result in any considerable financial benefit. They were promoting the Bill in conjunction with several other Gas Companies. He moved that the Bill be sanctioned; and the motion was carried.

A Record Profit at Derby.

At the annual general meeting of the Derby Gas Company next Friday, the Directors will report that the gross profit for the year ending the 31st of December last, less interest on the bank account, amounts to £30,972, which, after deducting the interim dividend for the June half year and the interest on the debenture stock and deposits for the whole year, leaves a balance of £18,747. This with the balance of £3344, brought forward, makes a total of £22,091 available for distribution. The Directors recommend the payment of the standard rate of dividend on the consolidated stock at the rate of 5 per cent. per annum for the past half year, with an additional ½ per cent. for the whole year, making 5½ per cent. The Directors have arranged terms for the purchase of the undertakings of the Spondon, Ockbrook, and Borrowash Gas Company, and the Mickleover and Etwall Gas Company, and have deposited a Bill in Parliament for extending the limits of supply and other purposes. The Directors believe these purchases will prove to be of great advantage to the Company. The Directors report that the demand for prepayment meters and gas cooking-stoves continues to progress at a steady rate. The accounts accompanying the report show that the sale of gas last year produced £72,858, compared with £71,908 in 1904; the residuals yielded less by about £2000; and the total revenue was £97,847, against £98,610. On the expenditure side of the revenue account, however, substantial economies are shown. The manufacture of gas cost £51,032, compared with £54,416—a difference of £3384; distribution, £6662, against £6413 (the items of repairing mains and meters being heavier); rates and taxes, £5421, compared with £5355; and management, £3528, compared with £3505. The total expenditure was £66,841, against £71 059; and the balance carried to the profit and loss account, £31,006, compared with £27,552. The balance constitutes a "record," and is an increase of £3454 on that for the preceding year. The result is one upon which the Board and the Engineer (Mr. J. Ferguson Bell, Assoc.M.Inst.C.E.) are to be warmly congratulated. It means that, after paying maximum dividends, there will be about £9800 to carry forward, in addition to the reserve fund, which stands at £29,206. The Company commenced the year with a credit of £3343; so that during the year they have improved their position by £6500 in round figures. In addition to this, there has been a substantial addition to the reserve fund in the shape of interest on investments.

Competition of Gas with Electric Lighting at Malton.

The Chairman of the Malton (Yorks) Gas Company, Mr. Hugh W. Pearson, made some interesting remarks on the above subject when moving the adoption of the report at the half-yearly meeting last Wednesday. The town has come into prominence of late on account of the rather warm discussions in the District Council, of which the Company's Engineer and Manager (Mr. Henry Tobey) is Chairman, on the subject of the adoption of electric lighting for the streets. He remarked that the six months covered by the present accounts (June to December, 1905) was the first entire half year they had had to meet the competition of the electric light in Malton; and they were therefore in a position to make some comparison as to whether or not it was likely to be injurious to the Company. The result of the half-year's working, compared with that of the corresponding half of 1904, afforded proof that they had nothing to be afraid of. The total sales of gas to private consumers showed that they had sold only 187,000 cubic feet of gas less. This was practically nominal; and there was this curious feature about it, that whereas in Malton, where they had the competition of the electric light, there was no decrease, in Norton, where electricity had not been introduced, there was. It was almost entirely due to the abandonment of certain gas-engines, and probably, in a measure, to the fact that the North-Eastern Railway Company had reduced their consumption by introducing the incandescent light, which consumed less gas. The comparison, therefore, very clearly showed that the Company had not suffered, so far, from the competition. There was another point deserving notice. Though the total income from the sale of gas, apart from the public lighting, compared with the latter half of 1904, was less by £193, the shareholders must bear in mind that for the first portion of the half year the price of gas was 2s. 10d. per 1000 cubic feet, as against 2s. 6d. for the past six months. Turning to the other side of the account, they would find that, owing to their not having the public lighting of Malton, there was a decrease of £222 in the income. At the same time, in not having the labour in connection with the public lighting and the manufacture and distribution of the necessary gas, there was about £300 saved, of which over £91 represented the wages of lamplighters and others. The figures he had quoted really confirmed the Directors' opinion expressed

some time ago, that, as a matter of fact, they had been doing the public lighting at such a price as did nothing more than pay a bare interest on the capital sunk in connection with it. The public had now had, in the past lighting season, a fair opportunity of comparing the two systems of lighting—Malton lighted by the electric light, and Norton by incandescent gas-lamps; and he did not think on this point he need say much. Many persons had spoken to him on the matter, and they all agreed with him that in coming from Norton to Malton it seemed like passing from daylight into darkness. The report was adopted, and a dividend at the rate of 12 per cent. per annum (free of income-tax) was declared.

Effect of a Good Exhibition at Newport (Mon.).

In moving the adoption of the report at the half-yearly meeting of the Newport (Mon.) Gas Company on Monday last week, the Chairman (Mr. R. Laybourne, J.P.) stated that the Company made in the past half year 5½ million cubic feet of gas more than in the corresponding half of 1904, but that, owing to reductions, the receipts did not show a commensurate increase—it was only a little more than in the corresponding six months. The rest was absorbed in a loss upon residuals. Notwithstanding this loss, and the stress of competition, the Company were still able to pay the full statutory dividends without having recourse to the reserve fund, which was always gratifying. During the half year there had been held at Newport a very satisfactory exhibition of the gas industry, which, together with a lecture by Mr. Canning (the Company's Engineer and Manager) on the history of gas and the way to read meters, was very much appreciated by the public. The exhibition and lecture were of such an educational value that he hoped they would not hear in the future the absurd remarks about gas-meters that they had in the past. It used to be said that meters were frauds, and did not tell the truth. As a matter of fact, about 1200 meters were tested each half year, with the result that where they were found wrong they were in the proportion of 3 : 1 in favour of the consumers. The success of the exhibition seemed to excite their friends of the electric light fraternity, and a reduction was made in the price of current to private consumers. No such reduction took place in favour of public lighting, with the result that the ratepayers had to pay for the concession on the private lighting. He could only imagine that the lighting authority kept up the price until the time came when they would abandon electricity in favour of gas, and then be able to show what a great saving they had been able to make. The change was bound to come just as it had come in London and Liverpool. The motion was seconded by Mr. Cartwright and carried unanimously. Sir J. T. Firbank proposed that the usual dividend of 5 per cent. on the consolidated stock should be paid; and this was agreed to. A vote of thanks to the Directors and staff was passed, and acknowledged by the Chairman, Vice-Chairman, Secretary (Mr. T. H. Hazell), and Engineer.

BIRMINGHAM GAS COMMITTEE AND IRONMONGERS.

The Supply of Fittings and Stoves.

A deputation representing the Master Gas-Fitters' Association attended the meeting of the Birmingham Ironmongers' Association held on Tuesday night, to confer as to what action should be taken in view of the recent reply received from the Gas Committee (*ante*, p. 368). Mr. Harry Smith (the Chairman of the Ironmongers' Association) presided, and remarked that it was with regret that he had to report the result of the interview with the Gas Committee to be a failure. The deputation evidently failed to convince the Committee that they were acting unfairly to the traders, as the reasons the Committee gave for their action clearly showed. The fittings business, the Committee said, formed an asset of the gas undertaking purchased in 1876. That the fittings department was necessary to the development of the undertaking was hardly borne out by the increased consumption of gas and the diminishing trade shown by the Committee's figures in the department. It would be idle to suppose ratepayers would revert to oil-lamps, or even candles, supposing the Council abandoned the department. He failed, therefore, to see how it was necessary to the development of the gas undertaking. Sir Hallewell Rogers (the Chairman of the Gas Committee) said that nothing short of a mandate from the ratepayers would be considered sufficient for the Committee to recommend the Council to give up the fittings business. Therefore it behoved the gas-fitters and ironmongers to see if they could not obtain this mandate through the organizations and the different associations in the city. The case for the gas-fitters was ably put by Mr. C. Breeden and Mr. J. Thacker. The latter remarked that they, as business men, were suffering under a great injustice; and as they would not feel the benefit of its removal when they were buried, it behoved them to bestir themselves with a view to something being done quickly. It was eventually decided that the representatives of the Master Gas-Fitters' Association and the Ironmongers' Association should meet again to confer as to what further steps should be taken.

Standard Screw-Threads for Gas-Pipes.

Referring again to the above matter (*ante*, pp. 243, 307) in the current issue, the "Ironmonger" says: "We understand that some delay in issuing the gauges has arisen, owing to certain mechanical difficulties, which are only now being solved. The Committee had the option of countenancing the introduction of gauges of three qualities—soft, hard, or hardened. For obvious reasons, the first would have been neither desirable nor, in the long run, satisfactory. The soft gauge finished hardened was undoubtedly the ideal pattern; but it was found that, owing to the exceedingly narrow limits within which the Committee were resolved to work, the process of case-hardening upset the accuracy of the threads. It seemed at first that the hard class might have to be adopted; but there is reason to believe that within a short time the difficulty will be overcome, and hardened gauges will be available."

THE EXAMINATION OF LONDON WATER.

Our readers will doubtless remember that when the Metropolitan Water Board decided on appointing a Director of Water Examinations, Sir William Crookes and Sir James Dewar, who had for some years furnished the Official Water Examiner (Mr. Charles Perrin, M.Inst.C.E.) with monthly analyses of the water supplied to London, sent in their resignations. They continued their duties until October last, and completed 25 years' continuous supervision of the chemistry and bacteriology of the Metropolitan Water Supply. Originally, the water was examined by Sir William (then Professor) Crookes, Dr. Odling, and Dr. C. Meymott Tidy. Death and resignation removed the last two distinguished chemists; and then Professor (now Sir James) Dewar took up the work. In their final report they say that in the ten months of the past year during which they continued their investigations, they examined 10,712 samples of water bacteriologically, compared with 9146, 8822, 6953, and 6893 samples respectively in the four preceding years. They also made 2312 chemical analyses; making a total of 13,024 samples examined. From the autumn of the year 1880 till October last, analyses had been made of 58,489 samples, and bacteriological examinations of 61,081 samples—together, 119,570 samples—of water. We place these figures on record as evidence that the quality of the water supplied to the inhabitants of the Metropolis was well looked after.

At the meeting of the Water Board on the 22nd of July last, Dr. A. C. Houston was appointed Director of Water Examinations. He continued the work from the point at which it had been left by his two predecessors; and he has lately issued his report for November. It is the first of an intended monthly series, and is published in extended form in order to show the scope of the work at the official laboratory. Future reports will be more condensed. The work has been carried on at the Board's premises at No. 20, Nottingham Place, where the four-storeyed building has been fitted up for the purpose, at a cost of about £900. The caretakers reside in the basement, the ground floor is used for offices, the first floor is devoted to bacteriological work, the second to chemical work, the third to special purposes, and the fourth is chiefly used for the preparation and sterilization of nutrient media. The staff comprises two chemists, two bacteriologists, two laboratory assistants, six sample collectors, and three laboratory boys—the whole being under the control of the Director. With an average daily supply of over 200 million gallons to an estimated population of 6,700,000, with eight (or with certain district divisions twelve) water-works and a very large number of filter-beds, and with numerous deep wells and three sources of raw water supply, it has been a task of some complexity to organize an effective system of examinations at a moderate cost. No pains have been spared to render the work as thorough as possible. Samples are constantly collected from separate filter-wells (wherever this has been practicable), as well as from general filter-wells. All the works are visited on five separate occasions during each week; and samples are collected from the different filter-wells in rotation. It is proposed to supplement the routine collection of samples by special collections, so made as to control any weak spots in the routine method, and to make the examination of London water, as a whole, as perfect as the magnitude of the task will permit.

The actual work in the month of November included the examination, either chemical or bacteriological, of 1000 "official" samples—that is to say, of samples collected by the Director's assistants, who are specially trained with regard to the precautions to be observed by them. Of these samples, 291 were examined chemically and 709 bacteriologically. The great bulk of both classes were "routine" samples, taken in the daily business of collecting them; and only 16 were "special" samples, taken for some particular purpose. The results obtained are set forth at great length and in tabular form, with many details which will be highly interesting to chemists and to bacteriologists.

WATER SUPPLY QUESTIONS AT LINCOLN.

Typhoid Epidemic Claims Settled—The New Boring.

At a Meeting of the Lincoln City Council last Tuesday, the Mayor, in proposing the adoption of the minutes of the Council in committee, said they referred to what were known as the typhoid relief claims. It was a matter of public knowledge that some time ago claims were preferred against the Corporation for typhoid fever alleged to have been contracted by drinking water supplied by them. The Corporation were not prepared to admit liability, but rather to go to law; and they began to make arrangements for so doing. It seemed to some of the members, however, that even if successful in their action the fight must entail an expenditure of thousands of pounds. The Finance Committee, after full consideration of the matter, appointed their Chairman (Mr. Pennell), himself (the Mayor), and Mr. Page to confer with those who brought actions—or rather with their Solicitors. The other side were animated by the same desire as themselves; and the Finance Committee were able to report that the Solicitors, on behalf of their clients, were willing, without the Corporation having to admit any liability, to accept £2000 towards their out-of-pocket expenses, and undertake to bring no action against the Council. Those who brought actions against the Corporation were only a small proportion of the sufferers. There were many who abstained from taking proceedings; and the Corporation felt they would like to do something for them. The typhoid relief fund was still in existence, and had £1000 at disposal, which it was proposed to ask the Committee to administer among the sufferers, after they had found what their total out-of-pocket expenses were in connection with doctors and nursing. The minutes were adopted.

With reference to the progress of the new water supply works, Mr. Ruddock stated that the boring had now reached a depth of 1430 feet, which was 30 feet deeper than the geological experts gave them to understand that the water-bearing sandstone would be found. They were told that the sandstone would be reached at a depth of 1400 feet; but the blue clay through which they had gone was 150 feet deeper

than was anticipated, and possibly the marls now being encountered would also be of greater depth than was estimated. In the meantime, efforts were being made to get water from the ballast pits. Boring operations had been undertaken, and a good flow of water had been secured. It was hoped that from this source, in conjunction with the Hartsholme Lake, 755,000 gallons would be available daily. It would, however, be necessary to spend £7100 in replacing the old culvert with iron pipes. With these supplies and the 1,000,000 gallons anticipated from the deep bore, Lincoln would be independent of the River Witham supply altogether, except in abnormally dry seasons.

An inquiry has been held by Mr. E. A. Sandford Fawcett, on behalf of the Local Government Board, into the application of the Corporation for a Provisional Order to enable them to borrow £200,000 for the carrying out of the water scheme, and for other purposes.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The event of the week, in my line, has been the discussion, before the Second Division of the Court of Session, of the action relating to the pollution of an Edinburgh brewery well by tarry matters, which are said to have escaped from the disused gas-works in Edinburgh, and of which a report is given in another part of the "JOURNAL." It took three days to lay the case before the Court. All that has been accomplished, so far as appears, has been the saturation of the minds of the Judges with the bearings of the case, of which they will be able to make practical application if they should find themselves in a position to dispose of the action as it is now laid. As the case has been hung up, upon the question of the amendment of the record, so as to bring into it averments in support of the case which the Judge in the Outer House discovered for the pursuers, it is not necessary to go into the debate. But it may be pointed out that the case is in a very peculiar position. The Judges have heard a case which was not clearly before them; and they have continued it to allow the parties responsible for bringing the action to consider if they will not now present the case which has been heard. If they should elect to do so, they must pay the expenses of the Gas Commissioners, with probably some deductions; and then the case will, as a matter of course, be sent somewhere for further proof, because the Commissioners must certainly be allowed to meet the new case. In this event, it will be quite another twelvemonth before the case is ready for the House of Lords, where, there is little doubt, it will take end. If the pursuers do not amend, but elect to stand or fall by what they have already brought forward, the case will go on in its present unsatisfactory position. The action will, it is fully expected, be enrolled again for Tuesday next, when the decision of the pursuers will be announced.

I do not think there has been a more successful meeting held under the auspices of the Scottish Junior Gas Association than the one which was held in Glasgow to-night. I went to the meeting with the expectation that there would be a good deal of discussion; and this was realized. Both the papers submitted were of a practical nature. The subjects—meters and gas-fires—were well calculated to appeal to the juniors, whose work is more particularly to look after the distribution of gas than to attend to the deeper problems attending the manufacture of it. As was to have been expected, then, the papers contained many valuable suggestions as to the handling of meters and the fixing of gas-fires. A word of explanation may be given as to Mr. Byers' communication. The great value of it lay in the practical illustrations he gave of the various parts of the interiors of meters both wet and dry, with explanations as to the reasons for adopting the particular designs, as well as their effects in working. These it is impossible to reproduce in letterpress; but Mr. Byers' remarks in this part of his communication formed quite an education in themselves, which those who were present are not likely to forget, but will benefit by in their own working.

The Gas Committee of the Kirkcudbright Town Council reported to the Council at their last meeting that they had before them a report by Mr. W. B. M'Lusky, of Perth, a former Manager of Kirkcudbright, regarding the condition of the gas-pipes in the burgh, and of the purifiers, and other matters. Mr. M'Lusky reported that the decayed condition of the service-pipes was due to the nature of the subsoil in some parts of the district. He advised the Committee to continue the use of wrought-iron tubes, but to protect them from the action of the subsoil by laying them in wooden boxes. He recommended that pipes be laid at a minimum depth of 2 ft. 6 in. In regard to the purifiers, the defect there was entirely due to the condition of the lime when it was placed in them. The leakage he noted was at present about 12 per cent.; and the reason for its being so high might be partly due to leaking joints and partly to consumers' meters registering at a lower average temperature than that at which the gas was measured at the station meter. Shallow mains not only contributed to loss of volume, but they further accounted for a loss in illuminating power. The minutes of the Committee were approved; and it was agreed to thank Mr. M'Lusky for his report.

The annual ordinary general meeting of the Coatbridge Gas Company was held on Thursday. Mr. James Johnston, the Chairman, said there was a considerable balance to the good, after paying the full dividends under the sliding-scale. It was agreed to reduce the price of gas for power purposes to 1s. 9d. per 1000 cubic feet; and if this should be found to be satisfactory, the Company will consider the advisability of reducing the price to ordinary consumers also. Dividends at the rate of 11 per cent. on the old shares, and £7 14s. per cent. upon the three issues of new shares, were declared. The present price of gas for ordinary purposes is 2s. 2d. per 1000 cubic feet.

Public lighting in Edinburgh is not a matter upon which the citizens have occasion to boast; and it would seem as if the management of the department were not altogether conducted upon lines which can be regarded as enlightened. In the Town Council on Tuesday, Mr. A. A. Murray asked how it was that, after they had decided to light the Portobello Road by incandescent gas-lamps, the work was now being done by the Electric Lighting Department. Mr. Wilson, the Convener of the Electric Lighting Committee, said that the policy of the Council had always been one of non-interference with the Lighting Committee as to the lighting of the streets; and the choice by them of electricity, in this instance, was easily justified. The thoroughfare was a main one, and a tramway route; and there had been a considerable increase in the maintenance of incandescent gas-lamps in other parts of the city where the roads were exposed.

CURRENT SALES OF GAS PRODUCTS.

Week ending Feb. 10.

The London market for both tar and ammonia products still remains somewhat quiet. At the same time, makers are well sold in most articles; and we hear of no quotation for a good London pitch at less than 33s. 6d. per ton. Ordinary creosote is recovering its steadiness, and would not now be quoted at under 2d. per gallon. For 60's crude carbolic, 1s. 10d. per gallon has been paid for some months ahead. Crystal carbolic acid is steady, and 39-40 would not be quoted at under 6⅜d. to 6½d. per lb. Benzol, 90 per cent., is reported to have been done at both 9¾d. and 9¼d. per gallon, and nothing less than 10d. would now be accepted. The best makes of solvent naphtha are in good request. Rather more interest is again being taken in anthracene, for which perhaps 2d. per unit might be accepted for 40-45 per cent. Sulphate of ammonia has been particularly quiet, and the quotations would not to-day be called more than £12 15s. per ton, on Beckton terms; but the remarkably good shipments for January are encouraging.

LIVERPOOL, *Feb.* 10.

Sulphate of Ammonia.

There has been a fair amount of buying going on; but it has not been enough to arrest the decline in values, supplies being abundant at all points except London, where prices have been maintained at a higher level than elsewhere. Although exports in January show a remarkable increase upon those for January, 1905, the fact does not seem to have disturbed the minds of buyers, who still seem inclined to wait upon events as far as possible. The closing quotations are £12 5s. per ton f.o.b. Hull, £12 7s. 6d. per ton f.o.b. Liverpool, and £12 10s. per ton f.o.b. Leith. The forward position has not received serious attention, and no important first-hand business has transpired. There have been large inquiries on the market, but the views of buyers have for the most part been too low for anything but rank speculation.

Nitrate of Soda.

This article has been quiet but firm at 11s. to 11s. 3d. per cwt., according to quality, on spot.

LONDON, *Feb.* 10.

Tar Products.

There has not been much business doing during the past week, and as a rule prices have been slightly easier all round. The demand for carbolic acid continues fairly good, and foreign consumers are still prepared to pay 1s. 9½d. for February-June; while some quantity of 75's is reported to have been sold at 2s. 2½d. f.o.b. in the North. A small business has also been done in 50's at 1s. 6d. to 1s. 6½d., according to place of shipment. Crystals are quiet. One of the largest English makers is reported to be again a seller at 6d. for early delivery. In 90 per cent. benzol, some quantity has again been sold for home consumption at a price equal to 9¾d. f.o.b.; but London refiners will not except less than 10d. for February-June shipment. There are still buyers of toluol at 1s. 0½d. for prompt; but there is practically nothing offering, and makers will not sell for February-June at under 1s. 1d. Solvent is still in very strong demand, especially for home consumption. London makers appear quite unable to deliver prompt, and just at present are not anxious to quote forward, as there seems so much uncertainty as to supplies during the next few months. The position of creosote remains the same. There has been a little business doing in Yorkshire; while in Lancashire the market is decidedly steady, and there is not so much offering as was the case a little while ago. In London, there are still sellers of salty oil for early delivery; but consumers appear rather indifferent as regards same. The market for pitch is very dull indeed, and there is no business to report so far as London is concerned; prices being purely nominal. Dealers are at present sellers at considerably under the quotations of manufacturers. There is a fairly good demand from South Wales, especially for early delivery, from which it would appear that business in briquettes is very brisk in this district. Continental consumers do not seem at all anxious to purchase, especially for early delivery, and they appear quite willing to wait a little before contracting forward. The position of anthracene remains unchanged; and there is no business to report for either prompt or forward delivery.

The average values during the week were: Tar, 18s. to 22s. Pitch, London, 31s. 6d. to 32s.; east coast, 29s. to 30s.; west coast, 29s. Benzol, 90 per cent., 10d.; 50-90 per cent., 10½d. Toluol, 1s. to 1s. 0½d. Crude naphtha, 4½d.; solvent naphtha, 1s. to 1s. 1d.; heavy naphtha, 11½d. to 1s. 0¼d. Creosote, London, 1⅝d.; North, $1\frac{7}{16}$d. to $1\frac{9}{16}$d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 22s. 6d. to 25s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market has been decidedly quiet during the past week; and although the shipments for January showed a decided increase, there is not much life in the article at the moment. Beckton still quote £12 15s. for February-June; but buyers are not inclined to pay this price. In Hull, sales are reported at £12 8s. 9d. for early delivery—in fact, £12 7s. 6d. was accepted in one instance for March shipment; but there is not very much business doing at this port. In Leith, business is again reported at £12 10s. by dealers, although manufacturers are quoting higher prices for both prompt and forward delivery. In Liverpool, business was done early in the week at £12 8s. 9d.; but later on £12 7s. 6d. is reported to have been accepted for early shipment. The market closes with a very quiet tone for both prompt and forward delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

There has been a general improvement in the house trade during the past week. The coldest weather we have yet experienced in the present winter extended over the last ten days; and it was surprising that the coal market could have been so peremptorily affected. Such, however, was the fact; but the extra demand has not affected prices. There has been no advance. Engine fuel keeps very steady; and it is anticipated that an upward movement in quotations will be sure to come, provided the requirements of trade continue in the same healthy ratio as at present. The demand for cannel has been very good during the last fortnight—more than an average quantity has gone out—still the requirements of gas companies are on the declining side, which naturally follows as the spring approaches. Steam coal keeps about the same in quantity required, and does not vary materially in cost. Furnace coal is selling better, and prices are well kept up—so much so in this department that, on renewals of contracts and on new contracts, from 3d. to 6d. per ton more money is readily obtainable. The quotations at the pits were: Best house coal 13s. 3d. to 14s. 3d., secondary 12s. to 13s., common 9s. to 10s., steam and forge 8s. to 9s., best engine fuel 7s. 6d. to 8s. 6d., best slack 6s. 6d. to 7s. 6d., medium 6s. to 7s., washed slack 7s. to 7s. 6d., common 5s. to 6s. Coal for shipping on the Manchester Canal 9s. to 10s. Furnace coke, delivered in Manchester and Salford, 15s. 6d. to 22s. 6d.

Northern Coal Trade.

There has been a more limited demand for coal; and the prices in some cases have been lower—as those who had bought some time ago have put fuel on the market, with the result of some lowering of the values. In the steam coal trade, best Northumbrians are lower, at from 9s. 4½d. to 9s. 6d. per ton f.o.b., second-class steams are steady at 9s., and steam smalls are rather scarce at 6s.; the lessened output of best coals limiting also the production of smalls, which are in fair demand. Durham coals are generally steady; but the demand for gas coals is now falling off in some degree. Prices range, according to quality, from about 9s. to 10s. per ton for Durham gas coals f.o.b. There have been one or two contracts entered into for gas coals—one for Italy, at a price expected to leave 9s. 10d. per ton f.o.b., making a moderate allowance for the freight from the gross price. The tenders for the Stockholm gas coal are now in hand, and will soon be decided on. These are expected to show an increase of about 9d. to 1s. per ton on the rates of a year ago, when the last of such contracts were settled. Others are to follow, and an increase is looked for all round. Coke is firm, in spite of talk of German competition; and this influences gas coke, which is in decreasing production. Good gas coke is about 11s. per ton f.o.b.; but the prices vary very much with the position of the producing works.

Scotch Coal Trade.

Trade continues to be active, though, on account of the scarcity of ships, the exports are down. There is a large volume of business doing, and prospects are good; there having been a great amount of forward selling, recently effected. The demand for steam coal is improving, which points to greater activity in the industrial world. The prices quoted are: Main 7s. 6d. to 7s. 9d. per ton f.o.b. Glasgow, ell 8s. 9d. to 9s. 6d., and splint 9s. 9d. to 10s. The shipments for the week amounted to 249,871 tons—a decrease of 7469 tons upon the preceding week, and of 1176 tons upon the same week of last year. For the year to date, the total shipments have been 1,037,784 tons—an increase of 84,497 tons upon the corresponding period of 1905.

Marsden Gas-Works Extensions.

Last Wednesday, an inquiry was held at Marsden by Mr. W. A. Ducat, on behalf of the Local Government Board, with reference to an application by the Urban District Council for a Provisional Order, to enable them to purchase land on which to extend the gas-works, to borrow money, and to amend existing Orders. Mr. J. W. Piercy, the Solicitor to the Council, explained that the Marsden Local Board acquired the works from the old Gas Company in 1887. At that time the area of the works was about 2000 square yards. The quantity of gas then manufactured was 7 million cubic feet per annum; while in 1905 it was nearly 25½ millions. In 1886, the price of gas was 3s. 4d. per 1000 cubic feet; whereas it was now 2s. 6d. for lighting and 2s. 4d. for heating. Additional land was urgently needed for a new purifying-house, coke and coal store, and other purposes. Provisional arrangements had been made to purchase 2966 square yards of land, which had for some time been used as a recreation-ground, at a cost of £800. The rateable value of the district was £27,154; and the amount borrowed by the Council for gas purposes was £5200. This had, however, been paid off to within £250. The estimated expenditure on the contemplated works was £6727, including the cost of the land. There was no intention to carry out the whole scheme at once. Evidence in support of the application was given by Mr. E. J. Bruce and Mr. R. H. Nuttall, the Gas Manager. There was no opposition.

Some Good Advice on the Sulphur Question.

In view of the fact that the Cambridge Town Council will shortly have to decide whether or not they will oppose the Gas Companies (Removal of Sulphur Restrictions) Bill, the "Cambridge Daily News" reprinted on Saturday the article in last Tuesday's "JOURNAL" (p. 336) addressed to local authorities who are opposed to the abrogation of the sulphur clauses, and offered a few well-timed editorial remarks on the subject. It is pointed out that the sulphur restrictions are applicable to only a very few gas companies, and that the representatives of local authorities who recently met in conference on the question seemed to have been very divided in opinion upon it, and that anything like a united front cannot now be expected. The explanation is that, on investigation, it was found that opposition to the Bill would be inadvisable for two reasons. In the first place, it would be ineffective, and in the second it would not be in the best interests of the public at large. Writing after perusal of the report of the Departmental Committee, our contemporary says, without hesitation, that "for the Cambridge Council to oppose the Bill would not only be waste of money, but would be actually prejudicial to the town generally"—the balance of evidence before the Committee being "emphatically in favour of the propositions contained in the Bill, and not against them." This is assuredly the proper line to take; and the view of the matter adopted by the writer in the paper referred to may be commended to the attention of the conductors of similar journals where the subject is likely to be discussed.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 408.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
160,000	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. 15	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 31	14	Bourne-mouth Gas and Water 10 p.c. / B 7 p.c. / Pref. 6 p.c.	29—30	..	4 13 4
51,810	10	,,	7		17—18	..	3 17 9
53,200	10	,,	6		15½—16½	..	3 12 9
380,000	Stk.	Aug. 16	12½	Brentford Consolidated	263—268	..	4 13 3
300,000	,,	,,	9½	Do. New	197—202	..	4 14 1
50,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
206,250	,,	Dec. 14	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 15	11¼	Brighton & Hove Orig.	223—228	..	4 18 9
246,320	,,	,,	8¼	Do. A. Ord. Stk.	162—167	..	4 18 10
460,000	20	Sept. 28	10	British	43—44	..	4 10 11
100,000	Stk.	Aug. 16	6	Bromley, Ord. 5 p.c.	121—124	..	4 16 9
165,700	,,	,,	4½	Do. do. 3½ p.c.	91—94	..	4 15 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12½—13	..	5 7 8
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	96—98	+1	4 1 8
150,000	20	July 13	8¼	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.	10—10½	..	4 5 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,443,280	Stk.	Aug. 31	5⅛	Commercial 4 p.c Stk.	117—119	..	4 7 4
560,000	,,	,,	5	Do. 3½ p.c. do.	113—115	..	4 6 11
475,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	,,	6¾	Continental Union, Ltd.	131—134	+2	4 17 0
200,000	,,	,,	7	Do. 7 p.c Pref.	143—148	..	4 14 7
424,070	Stk.	—	5½	Derby Con. Stk.	125—127	..	4 6 8
55,000	,,	—	4	Do. Deb. Stk.	108—110	..	3 12 9
486,090	10	Jan. 25	11	European, Ltd.	22½—23½	..	4 13 7
354,060	10	,,	11	Do. £7 10s. paid	16—17	..	4 17 0
15,223,235	Stk.	Feb. 8	4⅝	Gas-light 4 p.c. Ord.	93—99*	−½	4 8 11
2,600,000	,,	,,	3½	3½ p.c. max.	87—8⅞*	−¼	3 18 8
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	108—110*	..	3 12 9
4,193,975	,,	Dec. 14	3	Coke 3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	101—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	123—126	..	5 3 2
70,000	10	Oct. 13	11	Hongkong & China, Ltd.	20—21	..	5 4 9
3,800,000	Stk.	Nov. 15	10	Imperial Continental	238—240	..	4 3 4
473,600	Stk.	Feb. 8	3½	Do. 3½ p.c. Deb. Red.	95—97*	+¾	3 12 2
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	123—128	..	4 13 9
561,000	Stk.	Aug. 16	10	Liverpool United A	239—241	..	4 3 0
718,100	Stk.	Aug. 16	7	Liverpool United B	167—169	..	4 2 10
306,083	,,	Dec. 29	4	L'rpool Unit'd Deb. Stk.	109—111	..	3 12 1
75,000	5	Dec. 14	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Oct. 2	5	Met. of 5 p.c. Deb.	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	Nov. 15	3½	Monte Video, Ltd.	11⅞—12½	..	5 12 0
1,675,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	108—109	+½	4 4 10
406,025	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19—20	..	5 0 0
52,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	148—151	..	5 6 0
600,000	5	Sept. 14	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	Apl. 28	6	Primitiva Ord.	7—7⅜	..	4 0 0
796,980	5	Jan. 25	5	Do. 5 p.c. Pref.	5¼—5⅜	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
851,070	10	Oct. 13	7	River Plate Ord.	12¾—13¼	..	5 5 8
300,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
250,000	10	Sept. 28	7	San Paulo, Ltd.	13½—13¾	+¼	5 1 10
70,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50—52	..	4 16 2
135,000	Stk.	Sept. 14	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
543,498	,,	,,	10	Do. C	244—246	..	4 1 4
126,106	Stk.	Aug. 31	5½	Shrewsbury Ord. 5 p.c.	110—120	..	4 11 8
70,000	10	Sept. 28	10	South African	16—17	..	5 17 8
6,250,000	Stk.	Aug. 16	5½	South Met., 4 p.c. Ord.	130—132	..	4 3 4
1,895,445	,,	Jan. 11	3	Do. 3 p.c. Deb.	87—89	+1	3 7 5
575,000	Stk.	Aug. 16	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	127—132	..	3 15 9
112,533	,,	Jan. 11	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	Nov. 15	5	Southampton Ord.	109—112	..	4 9 3
120,000	Stk.	Aug. 31	6½	Tottenham A 5 p.c. / and B 3½ p.c.	125—128	..	4 17 8
363,020	,,	,,	4¾		99—102	..	4 13 2
125,000	,,	Dec. 14	4	Edmonton 4 p.c. Deb.	105—107	..	3 14 9
182,380	10	Dec. 29	8	Tuscan, Ltd.	9½—10	..	8 0 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
30,000	Stk.	Aug. 16	7¾	Wands-worth A 5 p.c. / and B 3½ p.c. / C 3½ p.c.	—	..	—
255,636	,,	,,	6¾		137—140	..	4 9 3
75,000	,,	,,	5¼		113—116	..	4 13 6
69,416	,,	Dec. 29	3	Putney 3 p.c. Deb. Stk.	82—85	..	3 10 7
745,872	,,	Aug. 16	5	West Ham 5 p.c. Ord.	105—107	..	4 13 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
193,300	,,	Dec. 29	4	Do. 4 p.c. Deb. Stk.	102—107	..	3 14 9

Prices marked * are "Ex. div."

Gas and Electricity at Crediton.

The Crediton Urban District Council, at their meeting last Tuesday again considered the matter of what steps should be taken with regard to the electric light question. It was decided to petition the Board of Trade in favour of the renewal of the Provisional Order granted to Messrs. Christie and Co. for the supply of electric light in the town, on the ground that to confer electric lighting powers on the Crediton Gas Company might create a monopoly. The Chairman (Mr. Elston) said the Council had already decided to take steps to oppose the Company's Bill. The Clerk explained the course which would have to be taken if the Council proceeded with their opposition; and, in answer to a question respecting the cost, he said he had written to a firm of Parliamentary Agents to ascertain what this would probably be. They replied that if the opposition was simple, and it was only necessary to oppose in one House, the costs would be between 60 and 70 guineas, irrespective of Counsel's fees. If opposition was withdrawn prior to the Bill going before Committee, the cost would be small. Mr. Mortimer said no member of the Council seemed prepared to fight the matter. He thought, however, they might easily present their petition. The Chairman was also of opinion that they ought to oppose, even if the cost were £500. It was decided to hold a special meeting to consider the desirability of passing a resolution to oppose the Bill.

Water Charges at Liverpool.

On the recommendation of the Water Committee, the Liverpool City Council have agreed to lay a domestic water-rate for 1906 of 6d. in the pound within the city and the borough of Bootle, and 9d. in respect of premises outside the limits. When the matter was before the Council, Alderman Burgess explained that it was quite impossible to go on for another year with the city rate at 4¾d. in the pound. In 1902, when the second Vyrnwy pipe-line was authorized, the rate was 7½d.; and he was strongly of opinion that it ought to have been kept at this figure. It was, however, decided two years ago to reduce the charge to 6d.; and this took from the Committee in a single twelve-month no less than £26,000. Not satisfied with this, a year ago the rate was still further reduced to 4¾d.; and the result was that in two years the Council had swallowed up a large portion of the reserve which the Committee had accumulated for the purpose of meeting the increased charge caused by the construction of the second pipe-line. Now, instead of having £60,000 in hand as they had two years ago, they had reduced their balance to £12,000; and if had it not been for the fact that they had had considerable increases in other portions of the account, the balance would have heen even smaller. They had spent £1,030,000 in providing the second pipe-line, and in other works; but notwithstanding this, the charge they now proposed was less than when they commenced the work of the second pipe-line. What the Committee were asking for was, he considered, a very modest and moderate proposal indeed.

Local Authorities and the Opening of Roads.

The Clerk to the Borough Council of Greenwich has issued a circular to the other Metropolitan Borough Councils on the subject of breaking up streets for main-laying and other purposes, which has been under consideration by the Council in connection with the several Bills introduced into Parliament by companies and others seeking powers to open the streets. He says it is the common experience of the Councils that unnecessary inconvenience is caused by the breaking up of streets, and that, particularly in suburban districts, mains which might well have been put down before the paving of a new street are often laid when this operation has just been carried out. It is thought by the Council that this inconvenience should be checked by some limitation of the powers of companies, if it could be imposed without depriving the community of such service as they are entitled to receive from the various undertakers. The Council believe that an improvement in this direction might be brought about by preventing the breaking up of newly-paved streets under certain conditions. With this object, they obtained the insertion in a Bill introduced last year of a clause providing that if the Council, before paving a street, should have given the company concerned notice and an opportunity of laying mains, they should be precluded for a period of three years from breaking up the surface of the street for laying mains, except on terms of relaying the entire width of the pavement. The Clerk stated that he had received instructions, in preparing petitions against the several Bills to be introduced into Parliament this year, to ask for similar protection for the streets of the borough. On behalf of the Council, he expressed the hope that the other Councils would consider this matter, and, if it commended itself to them, would ask for similar protection as regards the streets in their boroughs, so that, if possible, the various authorities might mutually support each other in a matter in which their common interests appeared to be involved.

Lighting of Torquay.—The Roads Committee of the Torquay Corporation reported, at a meeting of the Town Council last Tuesday, that they had been in correspondence with the Secretary of the Gas Company with reference to a suggestion that the Company should take over the public lighting of the town by contract. The Company stated that they were prepared to provide lamps which would be somewhat attractive, and would furnish a considerable increase in the amount of light by burners capable of affording about 80,000-candle power instead of some 10,000-candle power as at present. The Company further suggested the advisability of increasing the lighting hours; pointing out that the extra cost would not be much, as the standing charges would remain as at present. The Corporation were also asked if they would be prepared to pay a higher price per lamp than at present, taking into consideration the better appearance and increased lighting power, and to enter into a contract for a term of (say) ten years; the contract to include a clause providing for a sliding-scale based on the price of gas for the time being. Consideration of the proposals was deferred.

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Devonport Water-Works Arbitration.

It is expected that the arbitration proceedings arising out of the purchase of the Devonport Water-Works by the Corporation will be resumed in London on the 21st inst. The point that Mr. A. J. Ram, K.C., the Umpire, is to consider and decide is what Admiralty establishments in Devonport are entitled to a supply of water under the special conditions contained in the Company's original Act. In his award, which was given in 1904, he found that £268,000 was to be paid to the Company in the event of the Court being of opinion that the Admiralty are restricted in the use of the water supplied under the Act, and £209,920 if they are not so restricted. It may be remembered that the Court of Appeal, affirming the judgment of Mr. Justice Phillimore, ordered the award to be referred back for additional findings of fact.

Price of Gas at Otley.—The Otley Urban District Council have decided to ask the Gas Company for a reduction in the price of gas supplied for public lighting. The agreement with the Company is that they are to be supplied at 6d. per 1000 cubic feet less than any private consumer; and they are now paying 2s. 0½d. Only recently, however, the Burley District Council, as reported in the "JOURNAL," induced the Otley Company to bring down their price from 2s. 7d. to 2s. 3d. per 1000 feet; and the Otley Council now argue that, inasmuch as Burley only pay 2s. 3d., the price to Otley should be 1s. 9d. This would seem to imply that the Burley Council should, in their opinion, be regarded as a "private consumer."

Teignmouth Water-Works Loan.—In reference to the application of the Teignmouth District Council for power to borrow £21,830 to carry out works of water supply, a communication of considerable importance has been received from the Local Government Board. The Board ask to be informed whether the present works are to be abandoned or superseded when the new supply is obtained from Paignton. They also ask for an undertaking that, in the event of notice being given for the determination of the agreement with the Paignton Council, steps shall be taken to get a supply from another source, and if a fresh supply cannot be obtained, to pay off any outstanding balance of debt on the works in connection with the Paignton supply.

Lamp-Posts as Decorations.—Some time ago, when the Corporation of Plymouth decided to extend the electric arc lighting in the centre of the town, the shopkeepers in the thoroughfare in which the change was to be made asked that the pillars of the gas-lamps should be allowed to remain, and promised to adapt them to decorative purposes. This scheme has now been carried out. The pillars have been painted in bright colours, and the place of the lantern has been taken by large vases of beaten copper in wrought-iron frames. The vases have been filled with palms and other plants. The effect is novel and pleasing. If it is open to criticism at all, it is that the vases are too high from the ground. They, however, form bright spots of relief from the ordinary commercial aspect of the street.

Duties on Gas and Electric Meters.—According to the "Ironmonger," the Engineers' Association have written to the Director of the French Customs suggesting that Article 505 should be divided and modified with a view of retaliating against the new German tariff. Articles 891 and 902 of the latter impose 75 per cent. *ad valorem* on gas, electric, and water meters without clockwork, while the same goods with clockwork registers are charged £10 per 100 kilos. The Association suggest that the French rates should be raised to the same figures.

The Price of Gas at Blackpool.—The Blackpool Corporation have, owing to a fear of causing a rise in the rates, rejected the Gas Committee's recommendation that the price of gas should be lowered to general users from 2s. 4d. to 2s. 2d. per 1000 cubic feet. For motive purposes, however, it is to be reduced to 1s. 10d., and slot-meter users are also to be given the benefit of a reduction. At present the annual gas profits amount to £17,000; and the concessions now decided upon will mean a difference of only about £1100, while the Gas Committee's full proposals would have caused a difference of £4600.

Gas-Works Fatality in Dublin.—A verdict of "Accidental death" was returned by a Coroner's Jury who were called upon to inquire into the death of Joseph Kennedy, who died as the result of a fracture of the skull sustained while engaged at the gas-works in Great Brunswick Street, Dublin. It was stated that on Friday, the 2nd inst., deceased was clearing with a large iron shovel the pan underneath one of the furnaces. The pan was 2 feet lower than the platform on which he was working. He made a dash with the shovel to put back the cinders, but did not put them back far enough; and he then made a second dash for the same purpose. This time he missed the pan, with the result that the weight of the shovel pulled him down through an aperture which intervened between the platform on which he was working and the pan. Deceased fell down head foremost, and was unconscious when picked up. Kennedy had been 24 years engaged at the work, and was a most experienced, steady man.

West's Stoking Machinery for Manchester.—The Gas Committee of the Manchester Corporation have, on the advice of their Chief Engineer (Mr. J. G. Newbigging), decided to equip two of the retort-houses at their Rochdale Road Gas-Works with West's compressed-air stoking machinery. The machinery is to be installed in the "B" and "C" retort-houses at this station, and will replace the hydraulic stoking machinery which has been in operation for a number of years. The installation consists of two charging and two drawing machines for each retort-house, and three two-stage air-compressors (one as a duplicate), which will be placed in the new exhauster-house, where special arrangements have been made for their reception. The charging and drawing machines will include all the latest improvements, although, on general lines, they will be similar to West's machines which have been for many years in successful operation at the Bradford Road works of the Corporation. The air-compressors will be of new design, occupying less space, and giving greater efficiency than heretofore.

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Blackburn	1,250,000	St. Catherines (Remodelled)	250,000	Tonbridge	300,000
Windsor St. Works, Birmingham	2,000,000	Kingston, Pa.	125,000	Stretford	500,000
Saltley Works, Birmingham	2,000,000	Peterborough, Ont.	250,000	Oldbury	300,000
Colchester	300,000	Wilkesbarre, Pa.	750,000	Todmorden	500,000
Birkenhead	2,250,000	St. Catherines (Second Cont.)	250,000	Saltley, Birmingham (Third Contract)	2,000,000
Swindon (New Swindon Gas Co.)	120,000	Buffalo, N.Y.	2,000,000	York (Second Contract)	750,000
Saltley, Birmingham (Second Contract)	2,000,000	Winnipeg, Man.	500,000	Rochester (Second Contract)	500,000
Windsor St., Birmingham (Second Contract)	2,000,000	Colchester (Second Contract)	300,000	Newport (Mon.)	250,000
Halifax	1,000,000	York	750,000	Tokio, Japan	1,000,000
Toronto	250,000	Rochester	500,000	Pernambuco, Brazil	125,000
Ottawa	250,000	Kingston, Ont.	300,000	Malton	150,000
Lindsay (Remodelled)	125,000	Crystal Palace District	2,000,000	Duluth, Minn. (Second Cont.)	300,000
Montreal	500,000	Duluth, Minn.	300,000	Brockville, Ont.	250,000
Toronto (Second Contract, Remodelled)	2,000,000	Caterham	150,000	Smethwick	500,000
Belleville	250,000	Leicester	2,000,000	Gravesend	300,000
Ottawa (Second Contract)	250,000	Enschede, Holland	150,000	Newport (Mon.) (Second Cont.)	250,000
Brantford (Remodelled)	200,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Third Contract)	750,000
		Burnley	1,500,000	Toronto (Fourth Contract)	1,000,000
		Kingston-on-Thames	1,750,000	Montreal, Ont. (Second Cont.)	1,800,000
		Accrington	500,000	Hamilton, Ont.	400,000

Leeds, 1,800,000 C. Ft. Leicester (Second Contract), 1,000,000 C. Ft. Newcastle-on-Tyne, 1,800,000 C. Ft.

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Proposed Reduction in Price Referred Back at Barrow.—At last week's meeting of the Barrow Town Council, the Gas Committee recommended that the price of gas should be reduced from 2s. 6d. to 2s. 3d. per 1000 cubic feet. After a long discussion, however, the proposal was referred back to the Committee for further consideration.

Public Lighting of Brighouse.—The Highways Committee of the Brighouse Corporation have resolved upon an extension of their clockwork automatic system of lighting the street-lamps, especially in the more remote parts of the district; one object being to curtail the long journeys of the lamplighters. For a few months about twenty of these appliances have been in operation, and have given much satisfaction. The Committee have also determined to convert all the street-lamps in the borough to the incandescent system.

Leeds Tramways and the Haulage of Water-Works Material.—The Leeds City Council have agreed to a recommendation of the Water-Works Committee that the Tramways Committee should undertake the conveyance of material from the North-Eastern Railway depot to the new filter-beds at Headingley, at 1s. 3d. per ton. The quantity to be moved is said to be about 120,000 tons. The proposal was naturally strongly opposed by the Leeds Horse Owners' Association; but the answer of the Chairman of the Water Committee was that by tram haulage they would save £1500 straight away, and between £3000 and £4000 in the wear and tear of the roads.

Price of Gas to Prepayment Consumers at Leeds.—The Chairman of the Leeds Gas Committee (Mr. G. Ratcliffe), in reply to a question in the City Council as to what steps were being taken to place users of prepayment gas-meters under the same conditions as to price paid for gas as those using ordinary meters, said he hoped that within a very short time he would be able to submit to the City Council resolutions that would have the effect of reducing the price of gas to all classes of consumers. In making this announcement, however, he did not wish to create the impression that the recommendations would necessarily reduce the price of gas to users of automatic meters to the same level as that charged to users of ordinary meters.

Gas Poisoning Case at Salford.—A man and woman living together at Salford (who were stated to have been assisted home the worse for liquor) were subsequently missed by a relative who eventually proceeded to their house. The keyhole was stuffed tight with paper; and on admittance being gained, the place was found to be full of gas. The man (John Doherty) was lying on a sofa dead; while the woman was unconscious on the floor. On an examination of the house, it was discovered that the gas-pipe leading from the main to the meter had been broken; while the tap of the bracket in the kitchen was turned on. This, in conjunction with the fact that the front door keyhole was plugged up, seems to point to suicide; but possibly the woman, when she is sufficiently recovered to give evidence at the inquest, may be able to elucidate the mystery.

Public Lighting Charges in Belfast.—A deputation from the Belfast Police Committee has waited on the Gas Committee in regard to the charge made for the lighting of 420 lamps in the centre of the city, for which there has hitherto been paid a nominal rate of £2 7s. 6d., which the Gas Committee now wish to increase. The deputation explained that the Police Committee had in contemplation a new arrangement of lighting for the city; and they asked that until this system was promulgated and approved of by the Corporation, the Gas Committee should continue to supply gas at the rate now charged. The Chairman (Mr. J. A. Doran, J.P.) pointed out that at the present time the lighting of the lamps cost £3308, and all the Gas Committee received was £1026; so that there was a distinct loss to the ratepayers. The Committee were, therefore, anxious to have the sum increased; and if they could even get the cost price of the gas, and a due allowance for the lighting of the lamps, they would be satisfied. It was decided that a joint meeting of the two Committees should be summoned to take the matter into consideration.

Gas-Engines and Electric Motors on Hire-Purchase.—During a discussion in the Birmingham City Council on a proposal that the Electricity Committee should be authorized to supply motors and switches on the hire-purchase system, Alderman Sir Hallewell Rogers remarked that in 1900 the Gas Department tried the letting-out of gas-engines upon this system; and after an experience of two years they withdrew it, because they did not find that the expenditure of public money involved was repaid. He hoped the Electricity Department had considered the question fully, and that if they found the arrangement did not pay, they would be able to withdraw it at once. Alderman Martineau congratulated the Committee upon what was, he considered, a very wise step. Facilities given to small manufacturers and small users of electric motors ought to have a beneficial effect upon the trade of the city, and lead to the development of small trades. As a member of the Health Committee, he also thought that the step was an important one; for it was known that a quantity of the smoke of the city was from small steam-engines. The proposal was adopted.

Public Lighting in Marylebone.—The Finance Committee of the Marylebone Borough Council have passed a supplementary estimate of £450 for gas for street-lamps, and £650 for their maintenance. It is explained that the extra gas is owing to a large number of lamps having been fitted with double instead of single incandescent burners, and the maintenance charge has increased in consequence of the further outlay of £3000 for completing the incandescent system within the current financial year, instead of leaving a portion of the work to be done until next year. In a further report, the Committee state that the estimate for gas for street lighting for the coming financial year shows an increase of about £1000. This is to provide for improved lighting in Oxford Street, and it was based upon offers already received. A sum of £1600 was allowed in the estimates for the installation of a new system of gas lighting in Oxford Street, and the Committee were advised that this would be adequate for the purpose, according to the estimates obtained. The cost of lighting, extinguishing, maintenance, &c., showed a considerable increase, which was accounted for by the completion of the incandescent gas lighting throughout the borough with the exception of Oxford Street; but the Committee had been assured that sufficient had been estimated to cover any cost which will be incurred by the completion of Oxford Street lighting.

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Gas v. Electricity for Club Lighting.—At the second annual meeting of the Sunderland and North Durham Liberal Club, it was stated that the financial position was better last year than in 1904; and that by the change from electric light to gas they had saved £49 in the six months since it was effected.

Decreased Gas Consumption at Birkenhead.—During the quarter to Dec. 31, the quantity of gas consumed in Birkenhead was 252,189,000 cubic feet, or a decrease of 5,324,000 feet as compared with the corresponding quarter of the previous year. Alderman Lees, the Deputy-Chairman of the Gas and Water Committee, ascribes this falling off to the extended adoption of incandescent burners for street lighting.

Cheaper Gas for Large Consumers at Devizes.—The Devizes Urban District Council have decided to reduce the price of gas to large consumers. At present the charge is 3s. 4d. per 1000 cubic feet for all consumers up to 100,000 feet per annum, with 5 per cent. discount, which brings it to 3s. 2d. The price from 100,000 to 150,000 cubic feet will now be 3s. 1d.; from 150,000 to 400,000 feet, 3s.; and over 400,000 feet, 2s. 10d. per 1000 cubic feet.

Disappearance of a Gas Manager.—The mysterious disappearance is reported of Mr. J. Hunt, who for a long time occupied the position of Secretary and Manager to the gas and water works at Goring-on-Thames. Mr. Hunt, it is stated, left home on Jan. 22 to attend a meeting of the Directors of the Company in London; but he did not arrive there, nor did he return home the same evening. Up to the present no tidings of him have been received. He has left a wife and three children unprovided for.

Kidderminster Gas Bill.—The Kidderminster Town Council have resolved not to oppose the Bill which the Gas Company are promoting to enable them to construct new works, raise additional capital, &c.; and the Mayor is to negotiate with the Chairman of the Company with reference to the concessions which the Company are willing to make under these circumstances. Alderman Parry remarked that, by withdrawing opposition, they could obtain concessions which would be of benefit to small consumers; while they would have the right at some future time to promote a Bill for the purchase of the works, if they thought fit to do so. It was, however, impossible to recommend the acquisition of the undertaking on the terms which had been mentioned —£110,226, besides other items of cost.

High-Pressure Incandescent Gas Lighting at Vauxhall Bridge.—At the meeting of the London County Council to-day, the Bridges Committee will submit a recommendation that the new Vauxhall Bridge should be lighted on the high-pressure incandescent gas system. The Committee have been in communication with the Gaslight and Coke Company with a view to ascertaining for what amount they would be prepared to supply and erect suitable standards with the requisite lamps, service-mains, &c., and also the navigation lamps; and they understand that it will be from £650 to £700—the exact amount being dependent upon the settlement at a later date of certain details of the work. There will be 16 standards erected, 12 of which will be on the bridge itself, and four on the approaches; with two dwarf lamps and standards on the southern approach. The lamps will be of the type in use in Kingsway and Aldwych, and will each contain two burners with a combined power of 660 candles, and be fitted with apparatus for automatic intensification.

A Writ against the Tenby Corporation.—At the instance of Messrs. James Mansergh and Sons, a writ has been served upon the Corporation of Tenby, in connection with a balance of £260 due for preparing plans and expert advice regarding the town's water supply; and, it having been pointed out that there was no fund from which the money could be paid, the Council have resolved that, subject to the Solicitors not enforcing judgment, and agreeing to wait until the amount has been provided for in the 1906-7 rates, no defence shall be entered to the action. This decision was not, however, arrived at without opposition; one member contending that the ratepayers were not now liable for the payment of the money, as it ought to have been paid at the time, either by loan or out of the rates. He alleged that the Corporation were acting in collusion with Messrs. Mansergh's Solicitors to acknowledge the debt and put in no defence, and entered a very strong protest against such a proceeding; his opinion being that the case should be taken into Court and the circumstances fully explained.

Manchester Corporation Bill.—The poll of the ratepayers on the Manchester Corporation Bill has confirmed the opposition to the proposals generally which was shown at the town's meeting held to consider the measure. The Bill is a most comprehensive one; and to this fact, mainly, is ascribed its ill-fortune. Five separate resolutions —dealing with different portions of the Bill—were submitted; and only one had a majority in its favour. This had reference solely to the completion of certain water-works. Another resolution (dealing with the proposed construction of new tramways) was rejected by only a small majority; but in the case of the remaining three the adverse vote was simply overwhelming—four or five to one. Among the latter were the miscellaneous clauses of the Bill and the transfer of the Stretford Gas Company's rights in Chorlton-cum-Hardy. The opinion is expressed, however, that it is scarcely probable that the adverse vote on the resolution as a whole will be allowed to break up the negotiations. The price of purchase has been agreed upon, the City Council have approved the transfer, and the Local Government Board have given their sanction unconditionally.

It will be seen, from an announcement which appears elsewhere, that the Tottenham and Edmonton Gas Company are affording the shareholders, as well as the residents and gas consumers in their district, an opportunity of increasing or obtaining an interest in the undertaking. They are offering for tender £25,000 of additional "B" consolidated stock, a portion of the sum the raising of which was sanctioned by the proprietors two years ago. The standard dividend on the stock, with gas at the price of 3s. 8d. per 1000 cubic feet, is 3½ per cent.; and it is offered at a minimum price of £102 per £100. The last day for sending in tenders is the 9th prox.; and interest will accrue from that date. Any amount of stock, being a multiple of £5 but not less than £20, may be tendered for.

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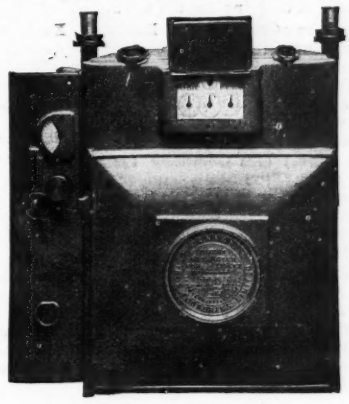

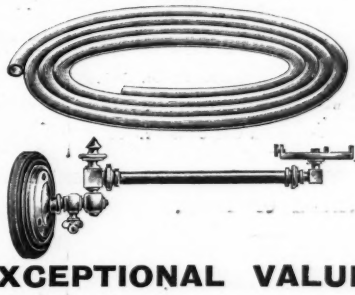

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A piece of land at Gowerton, about 2¾ acres in extent, has been acquired by a local Company for the erection of works for the supply of that town as well as Gorseinon and Loughor, with gas. The Engineer of the Company is Mr. F. G. Vivian, of Llanelly.

On Sunday week, the congregation of St. Michael's Church, Chelsea, were left in total darkness for about twenty minutes, owing to the failure of the electric light. The Rev. Canon Fleming, who was conducting the service, asked the people to remain seated while the gas was resorted to.

We learn that the whole of the £5000 consolidated "C" ordinary stock of the Croydon Gas Company which was offered for sale by auction on the 1st inst., in accordance with the announcement which appeared in the "JOURNAL" on Jan. 23, was sold at prices ranging from £230 10s. to £237 per £100.

There having been a considerable decrease in the consumption of gas at Conway, the officials connected with the department have been requested to report to the Council upon the matter, and also as to the districts in the borough to which gas-mains have not yet been extended and the cost of carrying out the work.

Acting on the advice of the Electrical Engineer, the Barking Urban District Council have decided that the execution of repairs to electric light wiring installations and the supply of fittings by the Electricity Department for private consumers shall be discontinued, and that regulations for the wiring of consumers' premises by private contractors shall be drawn up.

The Winstanley Speciality Company have received an order from the Newport (Mon.) Gas Company for the reconstruction of their retort-house, raising the walls and roof, and erecting a bench of horizontal regenerative settings and stage-floors, together with coal bunkers, elevators, conveyors, electric capstans, and travelling hoists; also for the construction of a new railway siding, embankments, and retaining-walls.

Attention may be called to an announcement which appears in another part of the "JOURNAL" to the effect that Messrs. Alexander, Daniel, and Co., will offer for sale by auction, on the 22nd inst., £15,000 of 7 per cent. maximum consolidated ordinary stock of the Bristol Water Company. It will be put up in £100 lots, at the reserved price of £147 each. The stock is part of the £970,000 authorized to be raised by the Company's Acts.

An interesting discovery has just been made in Church Street, Stoke Newington, during some excavations by the Metropolitan Water Board. As most readers are aware, in the early days of water supply, the pipes used were made of huge tree-trunks, which were hollowed out, and, being pointed at one end, fitted into each other, forming a continuous water-pipe. These relics of the past come to light from time to time; and those just found were in excellent preservation.

The Crewe Town Council (who at present obtain their water from the London and North-Western Railway Company) have decided to spend £500 on boring operations in the district, in order to ascertain whether they can secure an adequate supply for the town. No doubt the recent refusal of the Railway Company to reduce their charges has to a large extent influenced this step; but nevertheless a good many of the members of the Council were strongly opposed to the proposal now put forward.

The new water-works which are to be carried out at Los Angelos will cost £7,340,000, according to estimates by Mr. Frank H. Olmsted. "Engineering Record" points out that this is an enormous sum for a city of 105,000 population to pay for such works, and its amount is due to the £5,300,000 which the conduit—more than 250 miles long—will cost. In order to construct the conduit, it will be advisable, Mr. Olmsted says, to build a railway costing upwards of a million sterling along the line, and to erect three 600-barrel cement mills.

Messrs. W. C. Holmes and Co., of London and Huddersfield, have secured the services of Mr. Henry Howell, formerly Chemical Engineer and Assistant-Manager to Messrs. C. and W. Walker, Limited, with the view of further developing their manufacture of chemical plants—including sulphate and liquor ammonia, tar, benzol, sulphur-recovery, and coke-oven gas recovery plants—embracing all the latest improvements, and designed in accordance with the requirements of the Alkali Works Regulation Acts.

The De Laitte Gas-Machine Syndicate, Limited, has been registered with a capital of £20,000, in £1 shares, to acquire any patents and inventions relating to the production, treatment, storage, application, distribution, and use of air and gas, or any apparatus therefor; in particular, to acquire from L. B. de Laitte the benefit of certain existing inventions relating to improvements in making carburetted air, and in apparatus for the same, and to carry on the business of manufacturers of gas machines and appliances, &c.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ENGINEER AND MANAGER. Limerick Gas Department. Applications by Feb. 16.
TRAVELLERS (COAL AND CANNEL). No. 4544.
FOREMAN FITTER. Waterford Gas Company.
GENERAL CLERK. Littlehampton Gas Company.

Situations Wanted.

BLACKSMITH. Wilkins, Romford.
INSPECTOR, &c. No. 4557.
MAIN AND SERVICE LAYER, GAS FITTER, &c. Watson, Torquay.
MANAGER SMALL WORKS, OR GAS FITTER, &c. No. 4556.
SHOW ROOM MANAGER AND SALESMAN. No. 4558.

Plant, &c. (Second-Hand) for Sale.

EXHAUSTER. Uxbridge Gas-Works.
STATION METER. Redditch Gas Company.
WROUGHT-IRON TANK. Baker's, Scarborough.

Chemical Manufacturing Works.

SALE BY AUCTION. Gaunt, Widnes. Feb. 20.

Company Meetings.

BRENTFORD GAS COMPANY. Charing Cross Hotel. Feb. 16. 2.30 o'clock.
BRIGHTON AND HOVE GAS COMPANY. London Offices. March 2. Two o'clock.
BROMLEY GAS CONSUMERS' COMPANY. Bromley. Feb. 20. Six o'clock.
HARROW AND STANMORE GAS COMPANY. Albion Tavern. March 5. Twelve o'clock.
HORNSEY GAS COMPANY. Offices. Feb. 23. 3.30 o'clock.
MITCHAM AND WIMBLEDON GAS COMPANY. Works. Feb. 27. Three o'clock.
NORTH MIDDLESEX GAS COMPANY. Offices. Feb. 28. 3.30 o'clock.
SOUTHGATE AND DISTRICT GAS COMPANY. London Office. March 1. 3.45 o'clock.
TOTTENHAM AND EDMONTON GAS COMPANY. Offices. Feb. 24, Three o'clock.

Partnership.

INCANDESCENT MANTLE BUSINESS. No. 4552.

Stocks and Shares.

BEXHILL WATER AND GAS COMPANY. March 12.
BRISTOL WATER COMPANY. Feb. 22.
BRIXHAM GAS COMPANY. Feb. 24.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 22.
TOTTENHAM AND EDMONTON GAS COMPANY. March 9.

TENDERS FOR

Boilers.

GREAT WIGSTON GAS COMPANY.
MARKET HARBOROUGH GAS DEPARTMENT. Tenders by Feb. 24.

Brass Cocks and Fittings, &c.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Cookers.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Fire-Clay Goods.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Gasholder (Re-Sheeting and Addition).

WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by March 5.

General Stores, Ironmongery, &c.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.
STOCKTON-ON-TEES CORPORATION. Tenders by Feb. 16.

Lanterns.

WORKINGTON GAS DEPARTMENT. Tenders by Feb. 19.

Lime.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Meters.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Oil.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Oxide (New and Spent).

DARWEN GAS DEPARTMENT. Tenders by Feb. 21.

Pipes (Wrought and Cast), &c.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Sulphuric Acid.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Tar and Liquor.

BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.
BOLTON GAS DEPARTMENT. Tenders by March 1.
MANCHESTER GAS DEPARTMENT. Tenders by March 22.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT

THE First Dutch Bogore Co., Ltd., HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

OXIDE OF IRON.
(NATURAL.)
BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, & MESSEL, LTD.
(with which is amalgamated WM. PEARCE & SONS, LTD.),
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone 341, AVENUE.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

AMMONIACAL Liquor wanted. BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO., LOWER MOSS LANE, MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

BROTHERTON & CO., LIMITED. Offices: Commercial Buildings, LEEDS. Correspondence invited.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.** Illustrated sheets on application.
JOHN WALSH WALSH, SOHO AND VESTA GLASS WORKS, BIRMINGHAM. Telegrams: "VESTA, BIRMINGHAM." National Telephone: No. 63. London Show-Room: 4, HOLBORN CIRCUS, E.C.

GAS TAR wanted. BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia. BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. BOURNE, 120, Manor House Road, NEWCASTLE-ON-TYNE.

TAR AND LIQUOR WANTED. Best Prices paid.
DENT AND CO.,
Ouse Chemical Works, SELBY.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

TO WATER AND GAS COMPANIES REQUIRING CAPITAL.
THE Water and Gas Debenture Share Investment Trust, Limited, of 37, High Street, Tunbridge Wells, are prepared to Invest £10,000 Capital in above, and also to Underwrite Progressive Water and Gas Companies' issues.

PATENTS AND TRADE MARKS PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

THE KEITH LIGHT.
OVER 2000 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON, E.C.

PARTNERSHIP—An Incandescent Mantle Manufacturer, with Fully-Equipped Factory, Plant, &c., capable of turning out 15,000 weekly, wants Partner. Capital £300. Every investigation.
Apply, by letter, to No. 4552, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, re-engagement as Main and SERVICE LAYER, Practical Gas-Fitter, &c. Moderate Wages. Abstainer. Excellent Testimonials and References.
Address G. WATSON, Orchard Cottage, Hele, TORQUAY.

BLACKSMITH well acquainted with Retort-House Fitting, Making and Repairing Tools, can take Working Foreman's place, or Charge of Small Works (Nineteen Years' Experience, Eight Years last place; Abstainer), is open for Engagement.
H. WILKINS, Gas-Works Cottage, Romford, ESSEX.

INSPECTOR requires Situation at end of Month. Thoroughly Experienced in Control of Workmen, Automatic Installations, every description of Lighting, including Public Lighting, Mains and Services, Advising Consumers, &c., and in Management of Show-Rooms. Highest References.
Address, No. 4557, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER seeks Situation as MANAGER of Small Works or Practical GAS-FITTER, having had First-Class Experience on and off Works, Public and Private Incandescent Lighting, Main and Services, Cookers, Fires, Indicing, &c. Long Service and Good References.
Address No. 4556, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a position as Show-Room MANAGER and SALESMAN. Ten Years Practical Knowledge of all latest and up-to-date Gas Appliances of every description—Cooking, Heating, and Lighting—and Maintenance of same. Applicant willing to start at small Salary with Bonus on increased Business. Good Address and First-Class Testimonials. Age 28.
Address No. 4558, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two or Three Travellers to sell Coal and Cannel. Must be well known to Gas Managers. State District known in, and full Particulars as to previous employment. Payment by Salary or Commission, or both.
Address No. 4544, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LITTLEHAMPTON GAS COMPANY.
WANTED, a General Clerk. Must have had Experience in keeping Gas Accounts. Shorthand Writer and Typist preferred. Age about 20. Salary commencing 25s. a week.
Apply, stating Age, with *copies* of Testimonials, by Friday, the 16th of February to the SECRETARY, Gas Company, LITTLEHAMPTON.

CITY OF WATERFORD GAS COMPANY.
FOREMAN Fitter wanted to Superintend Outdoor Fitters' Work and Interview and Advise Consumers. Must be well up in Interior House Fitting, including Cookers, Heaters, Geysers, &c., Main and Servicing, and all kinds of Incandescent Lighting, Public and Private. Good opening for a Smart, Intelligent, and Capable Man, five men having already vacated this position to become Gas Managers. Wages £2 per week.
Apply, in own hand-writing, stating Experience, Age, &c., to Mr. J. G. TOOMS, Manager, Gas-Works, WATERFORD.

LIMERICK BOROUGH COUNCIL.
(GAS COMMITTEE.)
THE above Committee will, at their next meeting, to be held on Monday, Feb. 19, consider APPLICATIONS for the position of GAS ENGINEER and MANAGER OF WORKS, at a Salary of £300 per Annum.
Candidates must be possessed of Practical and Technical knowledge of all the details connected with Gas Manufacture, Residuals, &c., Drawing up of Plans and Specifications for New Plant when needed, and generally to advise the Committee on the most up-to-date and economic principles of Gas Production.
Applications, stating Age, Experience, and Qualifications, to be accompanied with *copies* of Testimonials, to be addressed to the Chairman, Gas Committee, Limerick, on or before the 16th inst.
By order,
M. FITZGERALD,
Secretary.

WANTED, Gas Meters, Obsolete, Wets or Drys, for Cash.
ROSSE WORKS, Leeds Road, BRADFORD.

WANTED to Purchase, Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than Four Tons.
State Price to No. 4512, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REDDITCH GAS COMPANY.
STATION Meter for Sale. Handsome design. Perfect Condition. Capacity, 11,200 feet per hour. Cheap to immediate purchaser.
ALBERT E. LAYTON,
Manager.

WROUGHT-IRON Rectangular Tank, 11 ft. by 5 ft. 3 in. by 4 ft., made of Boiler Plates, with bolted-on Cover, two Manholes, suitable for hot well or similar purpose. Equal to new; cheap.
Apply, BAKER'S, Melrose Street, SCARBOROUGH.

EXHAUSTER FOR SALE — Waller's 10,000 cubic feet per hour, 16 in. by 16 in., complete with Connections and Elbow Disc Valves. In excellent condition.
Apply to the MANAGER, Gas-Works, UXBRIDGE.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE, cheap, the undermentioned—
Four PURIFIERS, 10 ft. by 10 ft. by 4 ft. 6 in. deep, complete.
Two ditto, 10 ft. by 10 ft. by 4 ft. 6 in. deep, complete.
Two ditto, 10 ft. by 5 ft. by 4 ft. deep, complete.
One Cast-Iron SCRUBBER, 12 ft. high by 6 ft. dia.
One ditto 4-inch VERTICAL CONDENSER.
A quantity of good GAS-VALVES, all sizes, from 4-inch to 24-inch diameter.
Inquiries Invited for any other Gas Plant.
Apply to SAML. WHILE & SON, 60, Queen Victoria Street, LONDON, E.C.

BOROUGH OF WORKINGTON.
TENDERS are invited for the Supply of Ten Dozen 14-inch Square Copper LANTERNS for Public Lighting.
Specifications and further Particulars may be obtained on application to Mr. George Keyte, Gas-Works.
Endorsed Tenders to be sent to the undersigned not later than Monday, the 19th of February, 1906.
JOHN WARWICK,
Town Clerk.

MANCHESTER CORPORATION GAS-WORKS.
TO TAR DISTILLERS AND OTHERS.
THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the Purchase and Removal, on the sliding-scale basis, of the COAL-GAS TAR to be produced at their Bradford Road Station during the period of One, Two, or Three Years, commencing at noon on the 31st of March, 1906.
Full Particulars and Tender Form may be obtained on written application to Mr. Charles Nickson, Superintendent of the Gas Department.
Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Coal-Gas Tar, Bradford Road," must be delivered at the Offices of the Gas Department, Town Hall, on or before Ten a.m. on Thursday, the 22nd day of March, 1906.
The Committee do not bind themselves to accept the highest or any Tender.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
Feb. 9, 1906.

MANCHESTER CORPORATION GAS-WORKS.
TO TAR DISTILLERS AND OTHERS.
THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the TAR to be produced by the Carburetted Water-Gas Plant at their Bradford Road Station during One, Two, or Three Years, commencing at noon on the 31st of March, 1906.
Full Particulars and Form of Tender may be obtained on application in writing to Mr. Charles Nickson, Superintendent of the Gas Department.
Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Carburetted Water-Gas Tar," must be delivered at the Offices of the Gas Department, on or before Ten a.m. on Thursday, the 22nd day of March, 1906.
The Committee do not bind themselves to accept the highest or any Tender.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
Feb. 9, 1906.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the supply of Machine-Moulded FIRE-CLAY RETORTS, FIRE-BRICKS, CAST-IRON PIPES, WROUGHT-IRON TUBES and FITTINGS, BRASS COCKS, GAS-METERS, GAS-COOKERS, OIL, LIME, IRONMONGERY AND SULPHURIC ACID, as may be required from the 1st day of April next to the 31st day of March, 1907.

Sealed Tenders, on Forms to be obtained at the Office of the Manager of the Gas and Water Works, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Stores," to be delivered at the Town Clerk's Office on or before Tuesday, the 20th of February, 1906.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the purchase of the surplus GAS TAR and OIL-GAS TAR produced at their Gas-Works from the 1st day of April next to the 31st day of March, 1907, delivered into the Purchaser's Tank-Waggons at the Gas-Works Siding.

Any further Information may be had on application to the Manager of the Gas-Works.

Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar," to be delivered at the Town Clerk's Office on or before Tuesday, the 20th day of February, 1906.

The highest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness.

BOROUGH OF DARWEN.
(GAS DEPARTMENT.)

TENDERS FOR OXIDE OF IRON.

THE Corporation are prepared to receive TENDERS for the Supply of 250 Tons of OXIDE OF IRON, delivered at their Sidings, for Gas Purification purposes, at their Works.

All Particulars may be obtained from Mr. A. H. Smith, Gas Engineer, Darwen, to whom all samples are to be sent.

Sealed Tenders, endorsed "Oxide of Iron," to be delivered to the undersigned at or before noon on Wednesday, Feb. 21, 1906.

The lowest or any Tender not necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, Feb. 6, 1906.

BOROUGH OF DARWEN.
(GAS DEPARTMENT.)

SPENT OXIDE.

THE Corporation invite Tenders for the Purchase of about 400 Tons of SPENT OXIDE.

All Particulars and Samples may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Spent Oxide," to be delivered to the undersigned at or before noon on Wednesday, Feb. 21, 1906.

No Tender necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, Feb. 6, 1906.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.

THE Directors of the above Company invite TENDERS for the RE-SHEETING of the inner lift of a TELESCOPIC GASHOLDER and the adding of an ADDITIONAL LIFT to same at their Gas-Works, Wilmslow.

Specifications and all Particulars may be had from the undersigned.

Sealed Tenders, endorsed "Gasholder," must be sent in to W. H. Welsh, Esq., 52, Brown Street, Manchester, not later than Monday, the 5th day of March, 1906.

WM. SENERS,
Engineer and Manager.

Gas-Works, Wilmslow,
Feb. 13, 1906.

GREAT WIGSTON GAS COMPANY.

TO BOILER MAKERS.

THE Directors of the above Company are prepared to receive TENDERS for the Supply and Erection, on Foundation provided, of a BOILER, 18 ft. by 6 ft., at the Gas-Works.

Full Particulars from the undersigned, to whom all Tenders are to be addressed.

The Directors do not bind themselves to accept the lowest or any Tender.

JOHN A. HARRIS,
Engineer and Manager.

Office: The Gas-Works,
Wigston, Feb. 6, 1906.

MARKET HARBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply and Erection, on Foundations provided, of One CORNISH BOILER, 18 ft. by 6 ft., at the Gas-Works, Market Harborough.

Specification and Form of Tender may be obtained from the undersigned on payment of £3 3s., which amount will be returned upon receipt of a *bonâ-fide* Tender.

Tenders, addressed to the undersigned, endorsed "Tender for Boiler," to be delivered at these Offices not later than Saturday, the 24th inst.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED T. HARRIS,
Manager and Secretary.

Gas Offices, St. Mary's Road,
Market Harborough, Feb. 7, 1906.

BOROUGH OF STOCKTON-ON-TEES.

ANNUAL SUPPLIES.

THE District Fund, Gas, and Electricity Committees of the Stockton-on-Tees Corporation invite TENDERS for the several ARTICLES and STORES required by them for the Year ending March 31, 1907.

Forms of Tender, Conditions of Contract, and all Information, may be obtained of the Borough Surveyor, Gas Manager, and Electrical Engineer.

Persons desirous of Tendering should state the Articles they desire to Offer.

Tenders, endorsed "Stores," and also marked for the particular Committee for which they are intended, on printed Forms only, to be delivered to me not later than the 16th of February, 1906.

The lowest or any Tender not necessarily accepted, and no guarantee will be given as to quantity required.

By order,
ARTHUR B. CROSBY,
Town Clerk.

Stockton-on-Tees,
February, 1906.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 639, High Road, Tottenham, on Saturday, the 24th day of February, at Three o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half-Year ended the 31st of December last; to declare Dividends, and to transact General Business.

The TRANSFER BOOKS for the CONSOLIDATED "A" and "B" STOCKS WILL BE CLOSED from Friday the 9th to Monday the 26th day of February, both days inclusive.

NOTICE IS HEREBY ALSO GIVEN, that at 3.30 o'clock in the afternoon, or so soon thereafter as the Business of the Ordinary Meeting shall have been concluded, and pursuant to the Standing Orders of both Houses of Parliament, an EXTRAORDINARY MEETING of the Proprietors will be held for the purpose of considering the Provisions of the Bill now before Parliament, intituled "A Bill to confer further powers upon the Tottenham and Edmonton Gaslight and Coke Company, and for other purposes." At such Meeting the said Bill will be submitted for the consideration and approval of the Proprietors.

By order,
JAMES RANDALL,
Secretary.

Chief Offices: 639, High Road,
Tottenham, Feb. 2, 1906.

COUNTY BOROUGH OF BOLTON.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas and Lighting Committee of the County Borough of Bolton invite TENDERS for the Purchase of the TAR to be produced at their Works.

Further Particulars and Forms of Tender may be obtained on application to Mr. William Walch, Office Superintendent, Gas Offices, Bolton.

Sealed Tenders, endorsed "Tender for Tar," and addressed to the Chairman of the Gas and Lighting Committee, Gas Offices, Bolton, to be delivered not later than Thursday, the 1st March prox.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton,
Feb. 9, 1906.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the County of London, on Friday, the 23rd day of February, 1906, at Half-past Three o'clock in the Afternoon precisely, to receive the Report of the Directors, and the Accounts for the Half Year ended the 31st of December last, to declare Dividends, elect Two Directors and an Auditor, and to transact the Business of an Ordinary General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 9th to the 23rd of February, 1906, both days inclusive.

By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

Offices: 63, Chancery Lane, W.C.,
Jan. 26, 1906.

MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.
(INCORPORATED BY ACT OF PARLIAMENT, 1867.)

NOTICE is Hereby Given, that the SEVENTY-EIGHTH ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held in the Board Room, at the Works, Mitcham, in the County of Surrey, on Tuesday, the 27th day of February, 1906, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of Accounts for the Half Year ended the 31st day of December last, to declare Dividends, to elect Directors and an Auditor in place of those retiring by rotation, and for General Business.

The TRANSFER BOOKS WILL BE CLOSED from the 12th inst. until after the Meeting.

By order,
BENJAMIN GREEN,
Secretary and Manager.

Offices and Works: Western Road,
Mitcham, Feb. 6, 1906.

HARROW AND STANMORE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Monday, the 5th day of March, 1906, at Twelve o'clock precisely, to receive the Directors and Auditors' Reports, to declare a Dividend, to elect two Directors and an Auditor, to consider the remuneration of the Directors, Auditors, and Secretary, and to transact any Ordinary Business of the Company.

The REGISTER OF TRANSFER BOOKS WILL BE CLOSED from Feb. 27, until March 5, both inclusive.

And Notice is Hereby Given, that an EXTRA-ORDINARY GENERAL MEETING of the above Company will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Monday, the 5th day of March, 1906, immediately on the conclusion of the business of the Ordinary General Meeting to be held on the same day, for the purpose of considering, and if deemed expedient passing, a resolution sanctioning the creation and issue, under the Harrow and Stanmore Gas Acts, 1873 to 1903, of £21,950 Debenture Stock bearing interest at the rate of 4 per cent. per annum, and the disposal of such stock in such manner and at such times and on such terms as the resolution may provide.

Dated this 13th day of February, 1906.

By order of the Board,
J. L. CHAPMAN,
Secretary.

Gas Office: Roxeth, Harrow.

MODERN METHODS OF
SAVING LABOUR IN GAS-WORKS

(WITH SIXTY ILLUSTRATIONS),

By C. E. BRACKENBURY, Assoc.M.Inst.C.E.

Being a Reprint of Six Articles contributed to the "ENGINEERING TIMES."

I. **Historical and General Introduction.**
II. **Inclined Retorts.**
III. **Stoking Machinery for Horizontal Retorts.**
IV. **Coke Plant.**
V. **Carburetted Water-Gas Plant.**
VI. **Purifying Plant.**

Price 3s. 6d. net.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Charing Cross Hotel, on Friday, the 16th of February inst., at Half-past Two o'clock precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such meeting go out of office, in compliance with the Company's Acts of Parliament.

By order.
WILLIAM MANN,
Secretary.

Office, Brentford,
Feb. 1, 1906.

NORTH MIDDLESEX GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, London, E.C., on Wednesday, the 28th day of February inst., at Half-past Three o'clock p.m., to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1905, to declare Dividends, to elect Directors, to appoint an Auditor, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 15th to the 28th of February, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

Secretary's Office: 5, Great Winchester Street,
Old Broad Street, London, E.C.,
Feb. 8, 1906.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the "Bell" Hotel, Bromley, Kent, on Tuesday, the 20th day of February, 1906, at Six o'clock p.m. precisely, to receive the Report of the Directors, with the Balance-Sheet certified by the Auditors, to declare a Dividend, to elect Two Directors and an Auditor on retirements by rotation, to raise further Capital, to authorize the issue thereof, and to transact generally the business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 3rd of February to the 20th of February, both days inclusive.

By order of the Board.
HENRY W. AMOS,
Secretary.

Offices: 156, High Street,
Bromley, Kent, Feb. 3, 1906.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, London, on Friday, March 2, 1906, at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1905, to declare Dividends, to elect Directors, to appoint a special Auditor, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 17th of February to the 2nd of March, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
Old Broad Street, London, E.C.,
Feb. 12, 1906.

SOUTHGATE AND DISTRICT GAS COMPANY

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, 5, Great Winchester Street, Old Broad Street, London, E.C., on Thursday, the 1st day of March prox., at 3.45 o'clock p.m. precisely, to receive the report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1905, to declare Dividends, to elect a Director, to appoint an Auditor, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 16th of February to the 1st of March, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

Secretary's Office, 5, Great Winchester Street,
Old Broad Street, London, E.C., Feb. 8, 1906.

PATENTS, DESIGNS, AND TRADE MARKS ACTS, 1883 TO 1902.

NOTICE is Hereby Given, that HARRY DARWIN, of Glenluce Villa, 41, Kingsbury Road, Gravelly Hill, Erdington, near Birmingham, Gas Engineer, seeks LEAVE TO AMEND THE SPECIFICATION OF LETTERS PATENT No. 15 of 1904, granted to him for "Improvements in or relating to Incandescent Gas and Analogous Lighting."

Particulars of the proposed Amendment were set forth in the "Illustrated Official Journal (Patents)" issued on the 7th of February, 1906.

Any person or persons may give NOTICE OF OPPOSITION to the Amendment (on Form "G") at the Patent Office, 25, Southampton Buildings, London, W.C., within One Calendar Month from the date of the said "Journal."

C. N. DALTON,
Comptroller-General.

HENRY SKERRETT,
24, Temple Row, Birmingham,
Agent for the Applicant.

WIDNES.

By order of THEO. S. SHEARD, Esq., the Receiver appointed Pursuant to an Order of the Court in the Chancery of the County Palatine of Lancaster, Liverpool District, in the matter of The Chemical Manufacturing Company, Limited, "The Marsh," Widnes.

MR. GEORGE GAUNT has received Instructions to SELL BY AUCTION, on Tuesday, February 20, at the Works, commencing at Two o'clock,

THE CHEMICAL MANUFACTURING WORKS, with the valuable Modern Machinery, Plant, and Accessories contained therein, and pertaining to the said Chemical Manufacture.

FIRST AS A WHOLE, or as a GOING CONCERN, subject to the Conditions of Sale to be then and there produced, when, if not so disposed of, then,

LOT 2—The Extensive Timber Constructed Buildings and Offices, together with Steam Boiler and Shafting; when, if so disposed of, then,

LOT 3—All Metal Tanks and Vats.

LOT 4—All Wood Tanks.

LOT 5—The 34-Horse Power National Gas-Engine and all other detailed Machinery other than contained in Lot 2.

The property is held under an Indenture of Lease for a term of 999 Years from the 1st day of January, 1901, subject to a yearly rental of £31 2s. 1d.

To be viewed on Saturday and Monday, February 17 and 19, when Catalogues, containing the Additional Particulars of Terms and Conditions of Tenancy, &c., may be had at the Works; also from T. S. SHEARD, Esq., Chartered Accountant, 13, Harrington Street; from Messrs. KELLY, PICTON, AND RILEY, Solicitors, 15, Lord Street; or from the AUCTIONEER, 25, Lord Street, all of LIVERPOOL. Telephone 5536.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

BRISTOL WATER-WORKS COMPANY.

SALE OF ORDINARY STOCK.

MESSRS. ALEXANDER, DANIEL, AND CO. will SELL BY AUCTION, at the Bank Auction Mart, Corn Street, Bristol, on Thursday, the 22nd of February, 1906, at Three o'clock in the Afternoon,

£15,000

BRISTOL WATER-WORKS 7 PER CENT. MAXIMUM CONSOLIDATED ORDINARY STOCK, in Lots of £100,

At the reserved price of £147 for every £100 Stock.

The above £15,000 Stock is part of the 7 per cent. Maximum Consolidated Ordinary Stock, amounting to £970,000, created under the powers of the Bristol Water-Works Acts, 1888, 1889, 1895, and 1902.

The Dividend is subject to proportionate diminution whenever the Maximum Dividend to which each class of Ordinary Shares or Ordinary Stock of the Company is entitled shall not be paid in full; but such diminution may be made up in subsequent years.

For further Particulars and Conditions of Sale apply to the AUCTIONEERS, Bank Chambers, Corn Street, BRISTOL; to Messrs. EDWARD GERRISH AND Co., Lloyds Bank Buildings, Corn Street, BRISTOL; or to

ALFRED J. ALEXANDER,
Secretary and General Manager.

Bristol Water-Works Office,
Telephone Avenue, Bristol.

BEXHILL WATER AND GAS COMPANY.

SALE BY TENDER OF ORDINARY SHARES.

THE Directors Give Notice that they will be prepared to receive, not later than Twelve o'clock at noon on Monday, the 12th day of March, 1906, sealed TENDERS for 1500 ORDINARY SHARES of £10 each, being a further portion of the Additional Capital the creation and issue of which was authorized under the powers of the Bexhill Water and Gas Order, 1901, by Resolution of the Extraordinary Meeting of the Shareholders of the Company held on the 30th day of January, 1902.

This Capital is required for payment of Contracts which have been entered into for carrying out the Extension Works authorized by the Company's Act of 1904.

The Shares will rank with the existing Ordinary Shares for a maximum dividend of Seven per cent.

The minimum price below which no Tender will be accepted has been fixed at £10 10s. per share.

In the event of the receipt of Tenders at the lowest Price accepted for a larger number of Shares than those proposed to be issued, such Tenders will be subject to a *pro rata* diminution.

Every purchaser will be required, on notice being given of the acceptance of his Tender, forthwith to pay to the Company the full price of the Shares sold to him, including any premium; and if from any cause whatever such price shall not be paid on or before the 21st day of March next, interest at 10 per cent. shall be paid thereon from that date until payment.

The registered holders of the Shares now sold will be entitled to dividend from the date of payment for same.

Forms of Tender can be obtained personally or by letter from the Offices of the Company.

By order of the Board of Directors,
ROBT. DOUGLAS JESTY,
Secretary.

Offices of the Company:
5, Sea Road, Bexhill-on-Sea.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £25,000 "B" ADDITIONAL CONSOLIDATED STOCK.

MINIMUM PRICE, £102 PER CENT.

IN pursuance of the Tottenham and Edmonton Gas Act, 1898, NOTICE IS HEREBY GIVEN, that it is the intention of the Directors of this Company to SELL BY TENDER £25,000 of the above CONSOLIDATED STOCK, to be paid up in full on or before the 23rd day of March next; such stock being a portion of Additional Capital authorized to be raised by resolution passed at an Extraordinary General Meeting of Proprietors held on the 20th of February, 1904, under the powers of the above-mentioned Act.

Particulars and Conditions, with Form of Tender, may be obtained on application at this Office; and Sealed Tenders must be sent in not later than Four o'clock on Friday, the 9th of March, 1906.

By order of the Board,
JAMES RANDALL,
Secretary.

Chief Offices: 639, High Road,
Tottenham, Feb. 2, 1906.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE OF WATER STOCK.

TO BE SOLD by Auction, in the Long Room of the Queen's Hotel, Fawcett Street, Sunderland, on Thursday, Feb. 22, 1906, at Two o'clock in the Afternoon prompt,

MR. ATKINSON GIBSON, AUCTIONEER,

£20,000

(Nominal) of Additional ORDINARY CAPITAL STOCK (Maximum Dividend Five per cent.) authorized to be created and issued under the powers contained in the Sunderland and South Shields Water Act, 1891.

The above Stock will be entitled to Dividend from the 1st day of January, 1906, and be registered in the name of the Purchaser free of charge.

A deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 1st day of March, 1906.

SALE OF £3000 FIVE PER CENT. PREFERENCE SHARES AND £2000 SEVEN PER CENT. ORDINARY SHARES

IN THE

BRIXHAM GAS COMPANY, LIMITED.

MR. S. F. DUGDALL is instructed by the Directors to SELL BY AUCTION, at the Market Hall, Brixham, Devon, on Saturday, the 24th of February, 1906, at Four o'clock precisely, in separate Lots, 300 PREFERENCE SHARES of £10 each, entitling the Holders to a Cumulative Dividend of Five per cent., which will be paid in priority to the dividends on the Ordinary Shares, and 200 ORDINARY SHARES of £10 each, entitling the Holders to a Standard Dividend of Seven per cent., subject to the sliding-scale based on the price of Gas. The Standard Price of Gas is 4s. per 1000 cubic feet. The Company was Established in 1838, and Incorporated in 1904 by special Act of Parliament. The authorized Capital is £20,000, of which the above £5000 remains to be issued.

The sale of Gas in 1903 was 7,619,300 cubic feet.
" " 1904 " 8,903,000 "
" " 1905 " 11,161,800 "
an increase of 2,258,800 cubic feet over the previous year.

The New Capital is required to pay for the extensions to the Works, which have been nearly completed, and which were necessitated by the rapid growth of the demand for Gas in the District. It will be issued *free of expense* to Purchasers.

Detailed Particulars of Sale, with Form of Instructions to Purchase, obtainable, post free, from the OFFICES OF THE COMPANY, in Fore Street, BRIXHAM, and 50, Cannon Street, LONDON, E.C., or of the AUCTIONEER, Brixham, DEVON.

Now Ready. Price 5s. 6d. Post Free.

REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1905.

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GAS AND CANNEL COAL MERCHANT,

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Sperm Value 878·85 lbs. per Ton.

Please apply for Prices, Analyses, and Reports, to the

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TROTTER, HAINES, & CORBETT,
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FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
LONDON OFFICE: H. CRESSWELL & Co., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

THE
"ROTARY"
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Efficiency Demonstrated.
APPLY—
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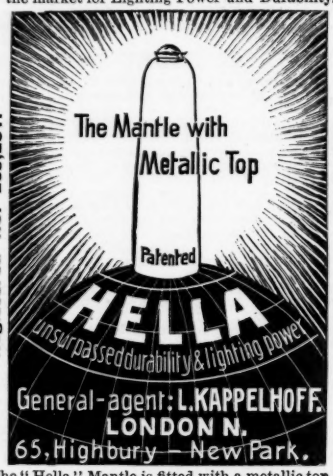
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large Stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

IT PAYS TO SELL **"HELLA" MANTLES.**
They show a good profit, and are the best Mantles on the market for Lighting Power and Durability.



The "Hella" Mantle is fitted with a metallic top, and made of special Ramie fibre. The metal top prevents shrinking, and enables the Mantle to withstand vibration.
Once Tried, Always Used. Agents Wanted, apply
L. KAPPELHOFF, 65, HIGHBURY NEW PARK, LONDON, N.

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"BOYS"
CALORIMETER
for determining the calorific value of gases
IS MADE BY
JOHN J. GRIFFIN & SONS,
— LIMITED, —
Makers of Scientific Apparatus,
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HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas
Above the Average in Weight and Quality of Coke.
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Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
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Make known your wants for Conveyors and Elevators to GILBERT LITTLE, the Pioneer Specialist; he will supply them.

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Highest Results in Gas, & Excellent Coke.
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NEWBATTLE COLLIERIES,
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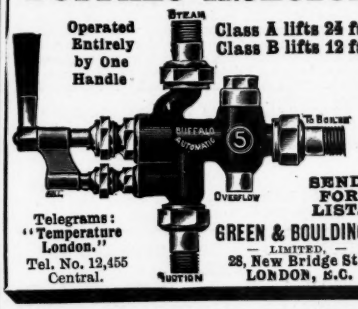
Operated Entirely by One Handle
Class A lifts 24 ft.
Class B lifts 12 ft.



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STEEL OF ALL DESCRIPTIONS.
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GAS PLANT
CEMENT
For AMMONIA JOINTS.
For TAR JOINTS.
Makers: JOHN E. WILLIAMS & CO., *Lower Moss Lane,* MANCHESTER, S.W.

Price 10s. 6d. Green Cloth, Gilt Lettered.
VOL. XCII.
OF THE
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ON THE ANALYSIS AND VALUATION
OF
OXIDE OF IRON AND LIME FOR PURPOSES OF GAS PURIFICATION,
WITH NOTES ON THE
Determination of Sulphuretted Hydrogen and Carbon Dioxide in Gas Liquor.
Amended and Enlarged from Articles published in the "Journal of Gas Lighting."
By H. LEICESTER GREVILLE, F.I.C., F.C.S.,
Member of the Society of Public Analysts, and of the Society of Chemical Industry. Late Chemist to the Commercial Gas Company, London.
Price 2s. 6d. Net.
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Ask for Catalogue and Particulars of Splendidly Constructed

MACHINES for INCERERATING INCANDESCENT MANTLES,

Trimming Machines & Collodium Machines, Well-made Wringing Machines, Patented High-Pressure Gas-Burners, &c.

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COAL AND COKE STORAGE PLANTS.

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STAMPED AND RIVETTED STEEL ELEVATOR BUCKETS.

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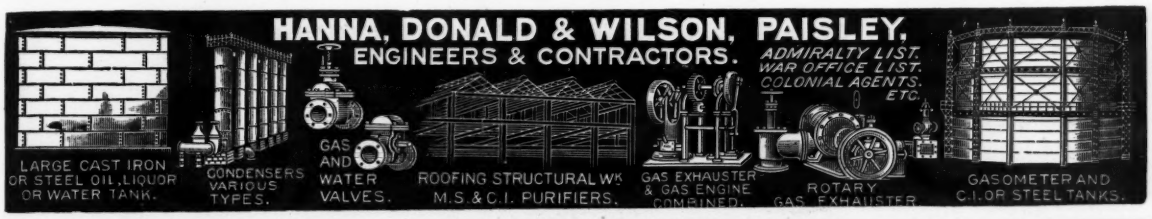
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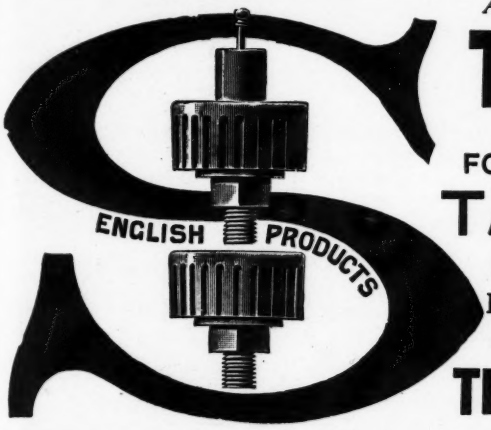
GAS EXHAUSTER & GAS ENGINE COMBINED.
ROTARY GAS EXHAUSTER.
GASOMETER AND C.I. OR STEEL TANKS.

A BOON TO MASTER, MAN, and MACHINE.



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SAVING UP TO **90** PER CENT. OVER LIQUID OIL.

Patent "Unbreakable" & "Telltale" Stauffer Lubricators.

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SPECIALLY HARD LUMPS FOR WATER-GAS CARBURETTORS & SUPERHEATERS.

Patent MACHINE-MADE RETORTS

Stoking Machinery is now in general operation at all large works, and the use of same has thrown a greater strain on the Retorts, thus the latter have to withstand a greater amount of wear and tear than formerly. After experimenting, we have succeeded in producing a Retort much harder in its general texture and composition, which we feel confident will give satisfactory results.

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MILES PLATTING,

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Gas and General Engineers.

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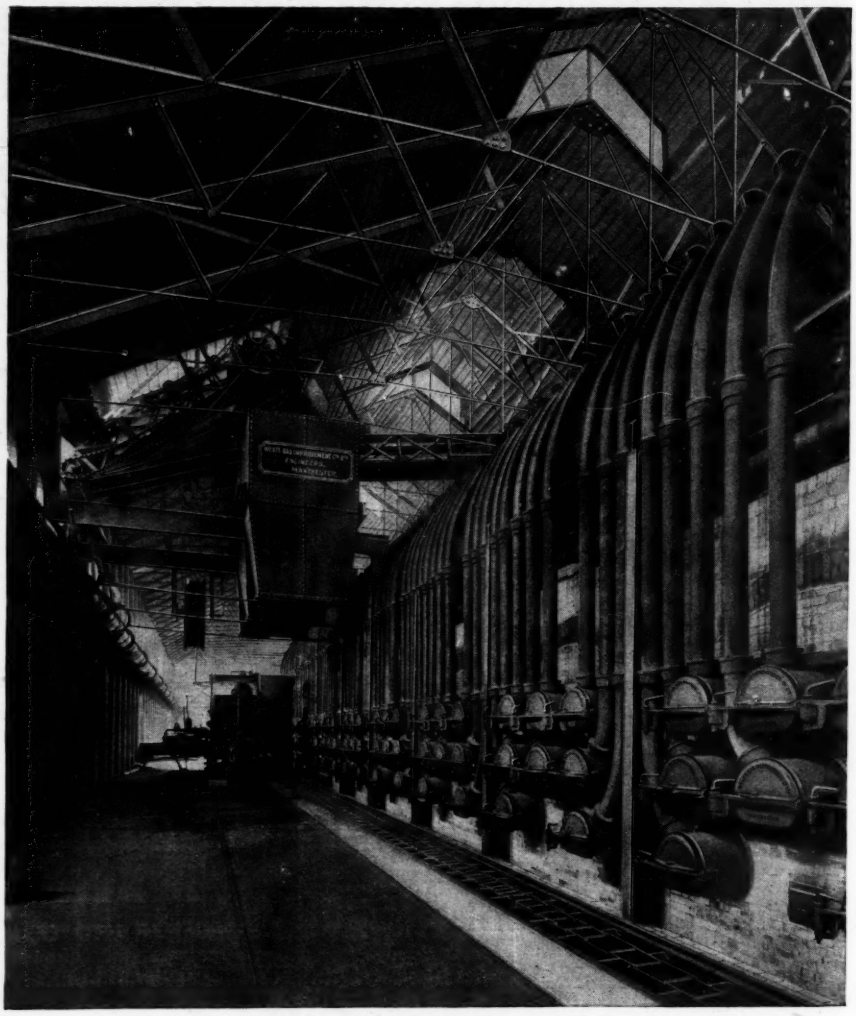
The "Hovey" Indicator
is fitted to the overhead Coal-Hoppers for gauging the depth of Coal contained in them.



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(PATENTED)

Fig. 35. 100 c.p.

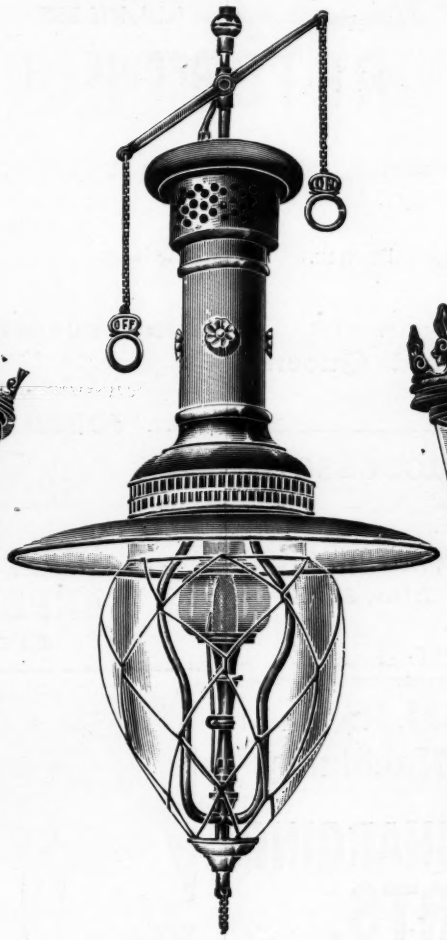

Fig. 607. 600 c.p.
Self-Intensifying.

Fig. 35a. 300 c.p.
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[See Illustrated Advertisement, Feb. 6, p. 388.]

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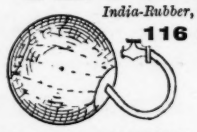

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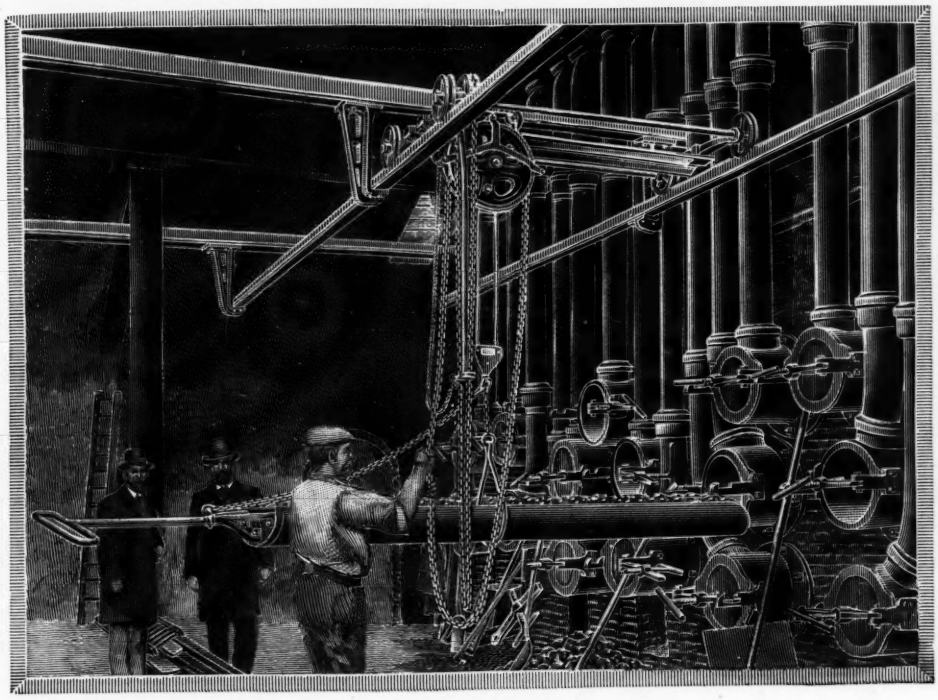

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Station Governors.

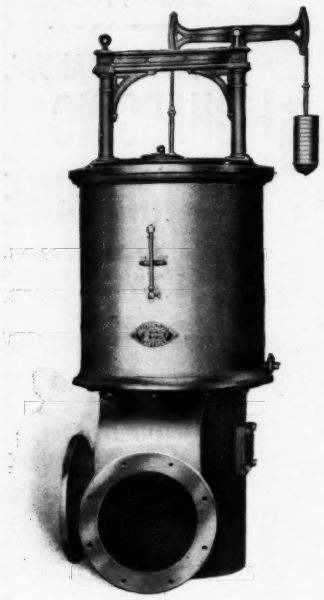

Fig. 1.

Fig. 1. shows our Standard Patent Safety Station Governor. The loading is conveniently arranged to be done by means of small weights on the counter balance lever.

Fig. 2. is our Standard Governor for Air loading from a distance.

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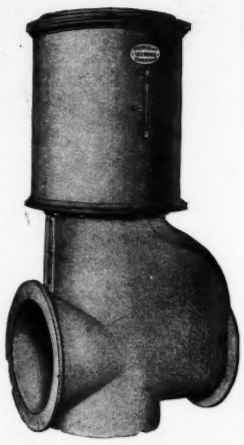

Fig. 2.

District Governors.

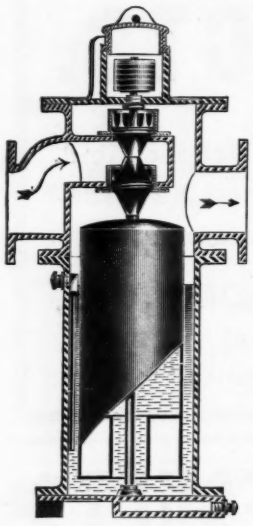

Fig. 3.

Fig. 3. Illustrates our Underground Constant Pressure Governor, while Fig. 4 shows the Differential Underground District Governor. In Fig. 3 the Pressure remains constant irrespective of changes of the Inlet Pressure, while in Fig. 4 the Governor automatically increases or diminishes the pressure following the changes made at the Station Governor. It is particularly useful for Hilly Districts.

Fig. 3 is shown for loading by weights; it may also be regulated by Air Pressure from a distance. Both Governors occupy very little space.

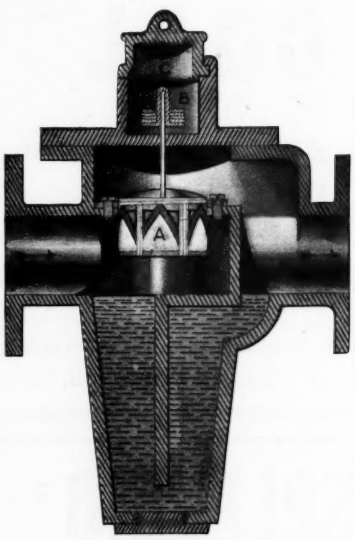

Fig. 4.

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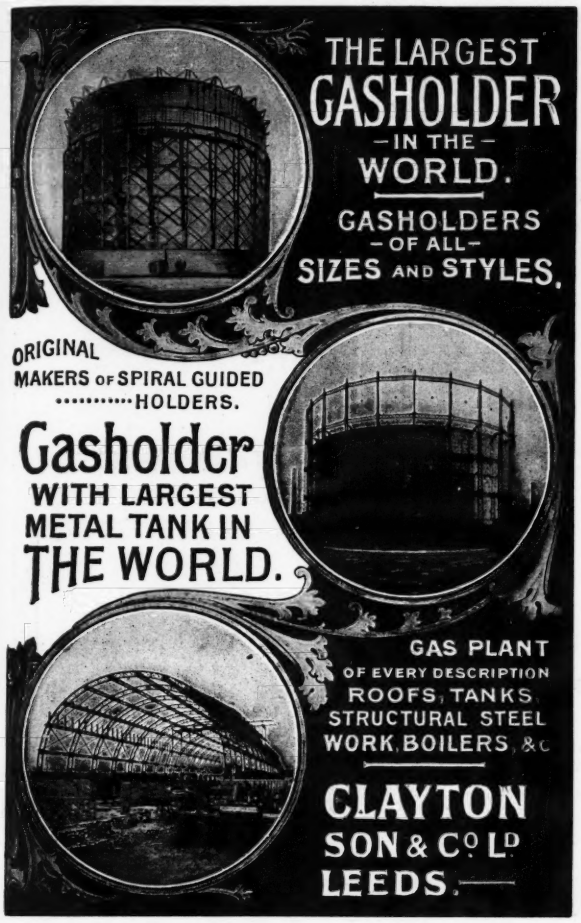

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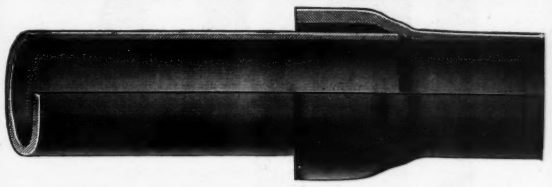

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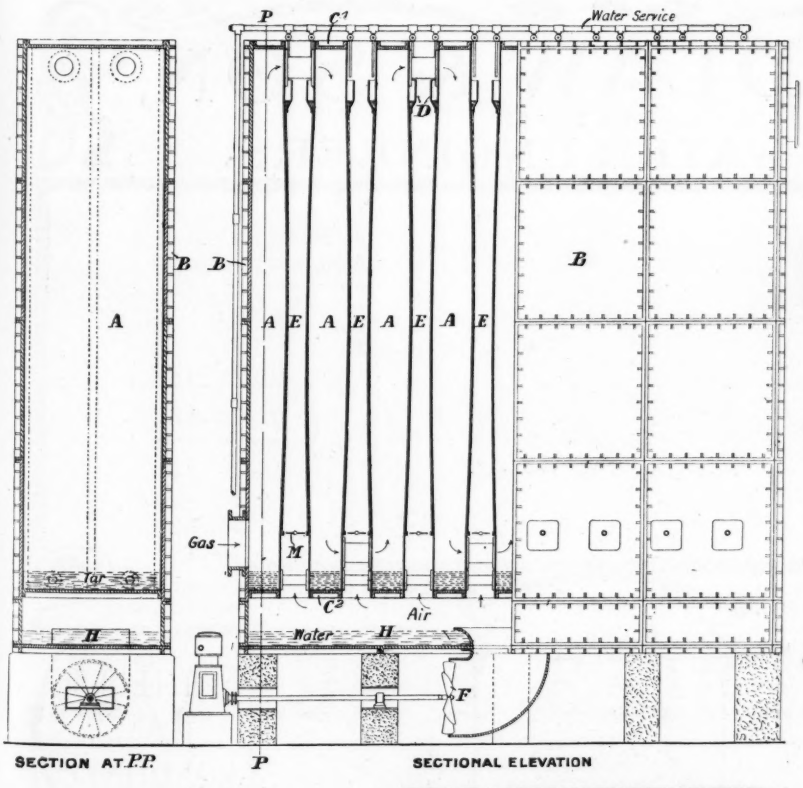

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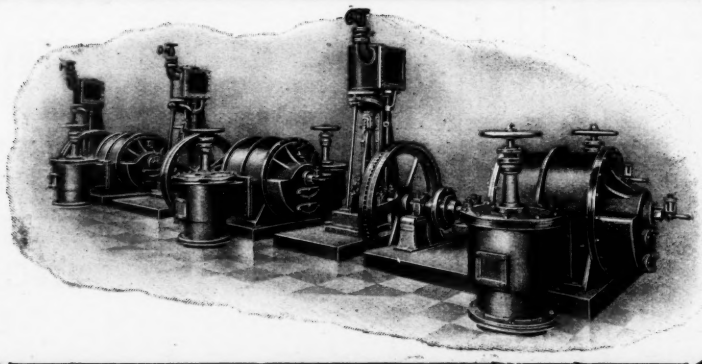

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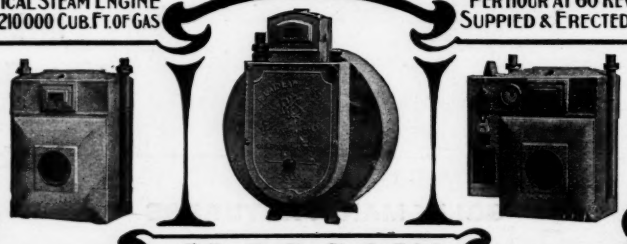

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